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WORLD PETROLEUM OUTLOOK—1984

HEARING

BEFORE THE

COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

SECOND SESSION

TO REVIEW THE CURRENT STATE OF THE WORLD OIL MARKET AND TO EXPLORE THE VARIOUS FACTORS WHICH MAY AFFECT THE PRICE AND AVAILABILITY OF OIL IN THE NEAR FUTURE

JANUARY 30, 1984

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Committee on Energy and Natural Resources

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CONTENTS

STATEMENTS

Page
Conant, Dr. Melvin A., president, Conant & Associates, Ltd 127
Cordesman, Anthony H., international policy editor, Armed Forces Journal 73
Eilts, Ambassador Hermann F., director, Center for International Relations, Boston University 175
Hodel, Hon. Donald Paul, Secretary, Department of Energy 14
McClure, Hon. James A., a U.S. Senator from the State of Idaho 1
Metzenbaum, Hon. Howard M., a U.S. Senator from the State of Ohio 11
Murkowski, Hon. Frank H., a U.S. Senator from the State of Alaska 10

APPENDIX

Responses from the Department of Energy to additional committee questions .. 185

WORLD PETROLEUM OUTLOOK—1984

MONDAY, JANUARY 30, 1984

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, D.C.

The committee met, pursuant to notice, at 10 a.m., in room SD-366, Hon. James A. McClure, chairman, presiding.

Present: Senators McClure, Warner, Murkowski, Hecht, Evans, and Metzenbaum.

Also present: Howard Useem, professional staff member; D. Michael Harvey, chief counsel for the minority; Elizabeth Moler, counsel for the minority; Benjamin S. Cooper, professional staff member for the minority; and James T. Bruce, counsel for the minority.

OPENING STATEMENT OF HON. JAMES A. McCLURE, A U.S. SENATOR FROM THE STATE OF IDAHO

The CHAIRMAN. The committee will come to order.

This is the second day of oversight hearings on the world petroleum situation and the outlook for 1984. The purpose of these 2 days of hearings is to review the current state of the world oil market, and to explore the various factors which may affect both the price and the availability of oil in the near future.

At Friday's hearing, the committee received testimony in closed session from the Departments of Energy, State, Defense, and the Central Intelligence Agency.[1] Today we will hear from the Secretary of Energy and from a panel of noted experts.

Several general observations can be made about the state of the oil market.

First, the current oil glut will not last forever. The increase in energy demand created by economic growth will inevitably absorb the surplus over the long run.

Second, one-third of the crude oil sold today in the world oil market passes through the 30-mile-wide Strait of Hormuz which is only minutes away by supersonic fighter from air bases located in Iraq and Iran.

Third, of the 11 million barrels per day of spare oil productive capacity worldwide, the majority is located inside the Strait of Hormuz.

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[1] The witness list for the closed session appears at the end of the chairman's opening statement.

Fourth, Middle Eastern countries have two-thirds of the free world's proven oil reserves; the United States holds 6 percent; and Western Europe has less than 4 percent.

Fifth, the United States is dependent upon foreign producers for nearly 5 million barrels per day of imported oil—one-third of the oil we consume—and the prospects for lessening our vulnerability are not good. U.S. crude oil production is declining, now 6 percent lower than it was during 1973.

Sixth, the war between Iraq and Iran continues to threaten stability in the Arabian Gulf, and the flow of oil from it.

Iraq's worsening economic situation may push it to take drastic action to bring the war against Iran to a close. This might occur in any number of ways. For example, Iraq could attack oil tankers loading at Iran's Kharg Island with Exocet missiles acquired from France.

Iran, on the other hand, views the conflict with Iraq as a holy war in which victory is essential. Like Iraq, Iran has the military capability for interrupting oil supplies from the gulf. It could do so by sowing mines; or by using its naval fleet to harass oil tankers; or by attacking ships with its air force; or by attacking the oil facilities of those Arabian Gulf countries who have supported Iraq in its war with Iran.

Although the United States has significant naval forces in the region, this is no guarantee of an uninterrupted flow of oil from the Arabian Gulf.

Finally, the unpredictability of the international energy situation has been amply demonstrated. Over the past 10 years, there have been three major oil supply disruptions which have increased oil prices more than tenfold.

Over the past three decades, there have been 13 significant international oil supply interruptions, only 3 of which occurred in countries located outside the Middle East. The only reason that supply interruptions before 1973 did not result in shortages was that sufficient spare productive capacity was on hand in the United States and elsewhere to make up for supply losses.

The inescapable conclusion is that the stability we see today in the oil market is but a veneer that could quickly and easily be stripped away. Simply because public attention is not focused at present on our energy situation does not mean that we are no longer vulnerable to oil supply interruptions.

I am a firm believer of the old adage that those who do not learn from history are condemned to repeat it. Thus, I find it both sad and unfortunate that the United States appears not substantially more prepared now for an oil supply interruption than we were in 1973.

Today we do not have any significant standby authorities to deal with an oil supply emergency. For example, we have no standby authority to allocate fuel supplies to time-sensitive sectors of the economy, such as farming, in the event of an emergency. We no longer have an antitrust exemption to enable U.S. oil companies to participate in the International Energy Agency. Although we have a partially filled strategic petroleum reserve, we do not have any contingency plans for withdrawal of oil from it.

If an oil supply disruption were to begin today, we would have to start from scratch to devise policies and regulations to minimize its impact on our economy and to protect those who are most vulnerable.

Responsible energy policy cannot, and will not, be generated in a crisis situation. We all saw what occurred in the pandemonium following the 1973 oil embargo.

It is obvious to me that the United States must begin to prepare both for the oil supply disruption that may occur at any time, and to develop those policies which will result in adequate supplies of more secure forms of domestic energy over the long run. Our economic performance is inextricably intertwined with adequate and dependable supplies of reasonably priced energy. Without this energy, the industrialized world as we now know it would quickly cease to exist.

Our first witness today is Secretary of Energy Hodel.

I want to welcome you before this committee again, Mr. Secretary. It's an auspicious beginning for the New Year that you're here and we're in business looking at what I think is a critical issue, and I'm sure the committee and others present today are interested in your views on what our current state of the world oil market is and what the outlook for 1984 may well be.

Senator Metzenbaum.

[The prepared statement of the chairman, the closed session witness list, and a statement from Senator Murkowski follows:]

STATEMENT OF
SENATOR JAMES A. McCLURE
30 January 1984

WORLD PETROLEUM OUTLOOK--1984

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Third, of the 11 million barrels per day of spare oil productive capacity world wide, the majority is located inside the Strait of Hormuz.

Fourth, Middle Eastern countries have two-thirds of the free world's proven oil reserves; the United States holds 6 percent; and Western Europe has less than 4 percent.

Fifth, the United States is dependent upon foreign producers for nearly 5 million barrels per day of imported oil--one-third of the oil we consume--and the prospects for lessening our vulnerability are not good. U.S. crude oil production is declining, now 6 percent lower than it was during 1973.

Sixth, the war between Iraq and Iran continues to threaten stability in the Arabian Gulf, and the flow of oil from it.

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Our first witness today is Secretary of Energy Hodel.

Welcome Mr. Secretary. I am sure that the Committee and others present today are interersted in your views of the current state of the world oil market and the outlook for 1984.

WITNESS LIST
WORLD PETROLEUM OUTLOOK
JANUARY 27, 1984

Friday, January 27, 1984

Honorable Richard McCormack
Assistant Secretary for Economic and Business Affairs
Department of State

Accompanied by:

Mr. James A. Placke
Deputy Assistant Secretary
Bureau of Near Eastern and South Asian Affairs
Department of State

Honorable Helmut Merklein
Assistant Secretary for International Affairs
Department of Energy

Lt. General Herman O. Thomson
Director, Plans and Policy Directorate
Office of the Joint Chiefs of Staff
Department of Defense

Accompanied by:

Major General Edward L. Tixier
Deputy Assistant Secretary
Near East and South Asian Affairs

Central Intelligence Agency

STATEMENT OF
SENATOR FRANK MURKOWSKI
BEFORE THE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

JANUARY 30, 1984

This morning's hearing on the World Petroleum Outlook will focus on events in the Middle East for reasons we all understand.

At the height of our dependence on Middle East sources of crude oil, we imported a significant percentage of our total crude oil needs from the region. Consequently, we developed the capability to project military force into the Middle East in order to protect our vital interests.

Today, only 3% of our total crude oil consumption originates in the Middle East. Nevertheless, we are maintaining no less than two Naval task forces in the region, including our Marines in Lebanon. We have AWACS aircraft constantly monitoring the situation in the Persian Gulf. We are maintaining our Rapid Deployment Force, headquartered at McDill Air Force Base, Florida, in a state of readiness. In short, we are putting our people and our resources on the line in the Middle East.

On the other hand, our allies depend upon the Middle East for a far greater share of their crude oil needs than we do. Japan imports approximately 65% of its crude from the region; West Germany, about 37%; Spain, 60%; South Korea, almost 80%. What contributions are these nations making toward the maintenance of peace and stability in the Middle East? Will we stand alone in Lebanon with the peacekeeping forces of the French and the Italians? Are we the world's policemen? How long will the American people, in the face of losses such as those our Marines have already suffered, allow this inequity to continue?

I mention these things, Mr. Chairman, in the hopes of encouraging our allies to contribute to the peacekeeping efforts in Lebanon a share proportional to their crude oil dependence on the region. While Lebanon is not a significant oil producing nation, stability in the entire region is linked to events in Lebanon. I hope our allies will understand that we shall not continue to bear these burdens alone.

STATEMENT OF HON. HOWARD M. METZENBAUM, A U.S. SENATOR FROM THE STATE OF OHIO

Senator **Metzenbaum**. I'm always happy to welcome the Secretary to our meetings, and am particularly interested in his observations today.

As the Secretary knows, many of us in the Senate, Congress generally, are concerned about the fact that the administration has turned the hands of the clock backwards with respect to the issues of conservation and the development of alternate sources of energy. And I have said publicly and will repeat today that the President's mark upon our Nation's history may be made more in connection with the total elimination of conservation programs and the total failure to move forward with respect to alternate energy resource development. It's saddening, and I want to commend the chairman for his opening statement, because I believe that he was right on target with respect to so many of the issues that we are concerned about and that the American people have a right to be concerned about.

But in talking about the whole question of oil supply, too often what we do is we address the issue but ignore an equally important issue from the standpoint of the American economy and the future of this nation and that is the issue of oil prices. Even if there is enough oil to go around, which is very disputable, and certainly in the event of certain developments, we would have panic buying throughout the world which would run up the price of oil, gasoline and other petroleum products.

Now back in the 1978–79 Iranian crisis, oil prices shot up 150 to 180 percent, even though the percentage of oil lost to the United States from Iran was extremely small to begin with, and other suppliers stepped in to compensate for that amount. The oil companies exploited the situation to run up the price 150 to 180 percent.

Today many experts agree that we will face sharp price increases in the future whether or not an oil blockage results in a true shortage. As a matter of fact, according to Donald Gunness of Socal, "If tankers are sunk," said he, "or Iran were to attempt to close the Straits of Hormuz, there is no question it would wreak havoc in the oil markets. I wouldn't be surprised to see oil prices double again under this kind of situation."

Yet the administration has told this committee time and time and time again that it will not intervene to keep prices down to protect the consumers. And the administration has said it will let market forces, let the free enterprise system, provide the means of adjusting with respect to the problem. And I read somewhere where they had said people ought to be storing up for that eventuality should it occur. How much of a joke can we make of the American people? As you know, Mr. Secretary, a recent mock drill run for the International Energy Agency showed that a partial blockage of supplies from the Persian Gulf would more than triple the price of oil from $29 a barrel to $98 per barrel or higher; $29 to $98.

Gasoline prices would shoot up to $4 per gallon within 3 months according to your Department's study. Inflation would increase by almost 10 percent. Almost 2 million people would be thrown out of work. And what is the administration's answer? They say that that study proves their point, that it just proves that market forces will be able to control the situation should such an eventuality develop, and the administration refuses to accept standby legislation that would allocate oil and dampen prices in the event of a true emergency.

Now it is a fact that the allocation legislation which the President saw fit to veto, if my recollection serves me right, I think was brought to the floor of the Senate by the chairman of the committee. Am I correct?

The **CHAIRMAN**. That's correct.

Senator **METZENBAUM**. And so it was not a Democrat or a Republican issue. We all felt a need.

The State of Vermont Energy Office pointed out after the IEA test the administration's policies will turn a supply crisis into an economic crisis, providing oil only to those who can afford it. I would hope that the Secretary while making his report today would indicate that the President and he had reassessed their position with respect to a mandatory allocation program. If it is right to be a participant in an international allocation program which this administration advocates and supports, then how is it wrong to have a domestic allocation program for the people of this country? That to me is a nonsequitor. Although it is not really part of today's agenda, I would hope that the Secretary would explain why the administration supports our participating in an allocation program that could only result in our Nation giving up its oil to other nations. That's the only possible result of that participation in the IEA. And then at the same time say, "but let the market forces prevail. We don't want an allocation program for farmers, hospitals, and those who would very much be in need in the United States."

I look forward to hearing your assessment on the world petroleum outlook. I'm particularly interested in hearing about measures that the Department is taking to deal with the shortage and to deal with drastic price increases that would result in even a partial blockage.

Thank you.

[The prepared statement of Senator Metzenbaum follows:]

U. S. Senator Howard M.
METZENBAUM
of Ohio

Committees:
Budget
Energy and Natural Resources
Human Resources
Judiciary

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FOR IMMEDIATE RELEASE
January 30, 1984

STATEMENT OF SENATOR HOWARD M. METZENBAUM
BEFORE THE SENATE ENERGY & NATURAL RESOURCES COMMITTEE
ON THE WORLD PETROLEUM OUTLOOK

January 30, 1984

Too often we address the issue of oil supply, but ignore an equally important issue--the issue of oil prices.

Even if there is enough oil to go around, panic buying throughout the world will run up the price of oil, gasoline and other petroleum products.

Back in the 1978-79 Iranian crisis, oil prices shot up 150-180 percent--even though the percentage of oil lost to the U.S. from Iran was small to begin with and other suppliers stepped in to compensate for that amount.

Today many experts say we will face sharp price increases, whether or not an oil blockage results in a true shortage.

According to Donald A. Gunness of Socal: "If tankers are sunk or Iran were to attempt to close the Straits of Hormuz, there is no question it would wreak havoc in the oil markets. I wouldn't be surprised to see oil prices double again under this kind of situation."

Yet the administration has told this committee time and again that it will not intervene to keep prices down to protect the consumers.

A recent mock drill run for the International Energy Agency (IEA) showed that a partial blockage of supplies from the Persian Gulf would more than triple the price of oil from $29 per barrel to $98 per barrel or higher.

Gasoline prices would shoot up to $4 per gallon within three months. Inflation would increase by almost 10 percent. Almost two million people would be thrown out of work.

Yet the administration refuses to accept standby legislation that would allocate oil and dampen prices in the event of a true emergency.

As the State of Vermont energy office pointed out after the IEA test, the administration's policies will turn a supply crisis into an economic crisis, providing oil only to those who can afford it.

I look forward to hearing Secretary Hodel's assessment of the world petroleum outlook.

I am especially interested in hearing about measures the Department if taking to deal with a shortage--and with drastic price increases that would result from even a partial blockage.

-30-

The CHAIRMAN. Senator Evans.

Senator EVANS. Mr. Chairman, I'll reserve any comments to the questions of the witnesses as they come, but I will be interested in following a line that aims at a somewhat different target than Senator Metzenbaum has suggested, that of allocation of prices. The flip side of supply of course is the efficiency with which we use our supplies and I'll be very interested in what we are doing, what we can continue to do to insure that we get all of the oil that is necessary to insure continued economic growth and do it a lot more efficiently than we've been accustomed to doing it in the past. There's still a great deal to be done along that line, and I'll be very interested in that line of questioning and whatever information the Secretary or the panel has that responds to that.

The CHAIRMAN. Thank you.

Senator Hecht.

Senator HECHT. Mr. Chairman, I want to compliment you and the Secretary, Secretary Hodel, for bringing this up because the change in our policy, because now we're going to start acting out a policy rather than acting out of an international crisis, so I commend you.

The CHAIRMAN. Thank you very much.

Secretary Hodel, your entire statement will be made a part of the record in full. You're invited to deliver that statement or hit the highlights or summarize in whatever manner you see fit at this point.

Secretary HODEL. Thank you Mr. Chairman.

STATEMENT OF HON. DONALD PAUL HODEL, SECRETARY, DEPARTMENT OF ENERGY

Secretary HODEL. In light of some of the comments that have been made here already this morning and in light of the fact that the statement contains a great deal of fairly detailed information, I would like to cover parts of it in more detail than is my ordinary practice when I appear before your committee if I may.

We recognize that 1984 is a year, in which it will be difficult to forecast precisely what will happen. We anticipate the oil consumption for the first time in several years will turn up. But we don't know what will happen to the prices because as we look ahead there is considerable supply capability in the world oil market that ought to have a downward pressing effect upon the price. Yet at the same time, as this committee is fully aware and knows very well from prior hearings, the Middle East particularly is not an area of great stability at the present time.

In the event of a cutoff in the Middle East, we could have a considerable reduction in the amount of production capacity that's available.

I'd like to review our projections and analysis for the outlook for world oil supply and demands for 1984 which are detailed in the tables accompanying my statement. I want to emphasize that any projection of world oil supply and demand in prices is fraught with uncertainty, and the only thing I say about forecasts is that, in the long run, we will find they were wrong. But at least they give us an idea of the kinds of things we should be preparing for, to which I'm sure the committee will want to address some questions.

I believe the prospects in 1984 allow us to face the future with more confidence than we've been able to do in the past. The U.S. energy system is less dependent on oil and has greater geographic diversity than we've had in the past. In the coming years our policies, if we pursue them aggressively, will lead to a more comfortable and a more secure energy posture. And as our economy recovers, there's no room for complacency. In fact, Mr. Chairman, I think you've raised it very well. In effect we are faced with a dilemma. On the one hand we cannot be complacent about the future and yet if we cry wolf, we create a sense of distrust on the part of the American people which is correct and valid in light of today's circumstances.

On the other hand, if we permit complacency and turn away from conservation and renewable efforts, and if we forget the importance of emergency preparedness and the strategic petroleum reserve, we do a great disservice because it leaves us more vulnerable than is the proper case.

For this reason we have participated, as the committee knows, in the International Energy Agency. We are committed to that organization. We are working together with the IEA to promote efficient balance and mixed energy systems while preserving for individual citizens free choice among a range of other energy options.

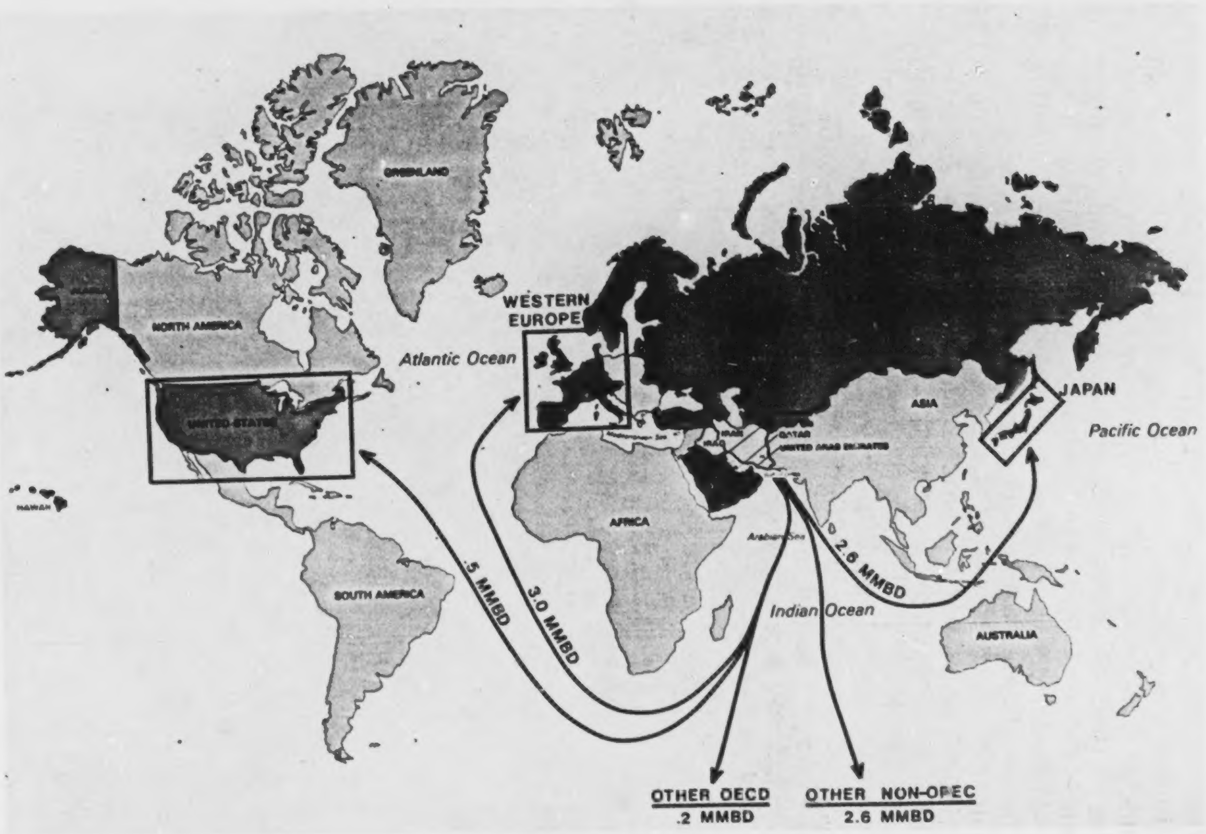
The consumption in the free world began to slide in the aftermath of the Iranian revolution and continued throughout 1983. The ongoing effects of weak economic growth outside the United States, price induced conservation and substitution and milder than normal winter temperatures throughout most of last year resulted in a decline of free world oil consumption of 1 million barrels per day or about 2 percent. This decline followed declines of 1.7 million barrels a day and 2.1 million barrels a day in the prior 2 years respectively. So that since that revolution the free world's utilization of oil has dropped about 7.7 million barrels a day from 52.4 million high which we experienced in 1979. This accounted for virtually all of the world oil decline in consumption and brought oil consumption to its lowest level in 13 years.

The OECD oil consumption continued to decline last year in spite of growth in gross national product. During my recent visit to the Middle East, I had discussions with the oil ministers of a number of OPEC nations. In the course of those discussions we talked about oil price and I was assured by the Saudi Arabian oil minister Sheik Yamani that he would assure a $29 price that would not drop below $29. By the same token, he felt for at least 2 or 3 years the price would not go above $29 a barrel, and that would be conditioned upon the consumption of oil produced by the OPEC countries rising to 24 million barrels a day.

We do not know how rapidly OPEC will reach 24 million barrels a day. It's hard to see how a $29 price will increase on those terms.

As you know the Iranians are reported to be asking that OPEC restore its $34 a barrel price. The Algerians would prefer to see something approaching an index system on price so it would go up a certain percentage each year and not suddenly hit customers of the OPEC countries with a rapid price increase.

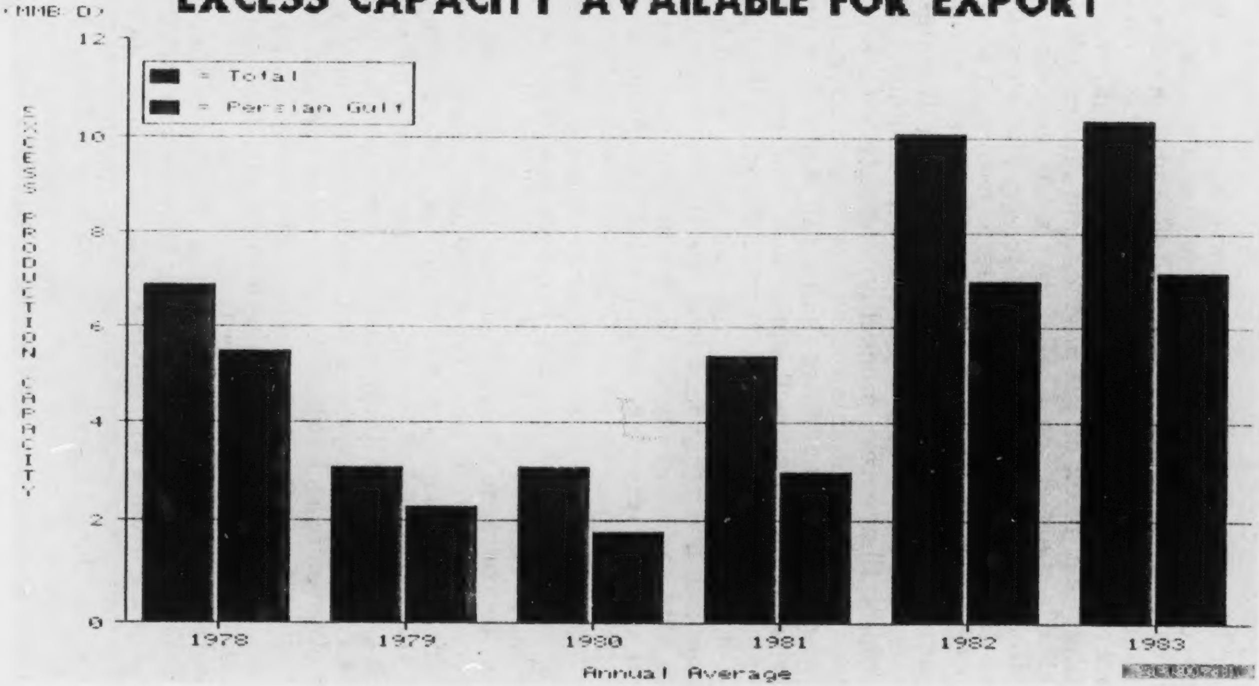
In our discussions I represented to these nations I believe that $29 a barrel was still a substantial incentive to the industrial nations of this world to continue their reduction of reliance upon oil. I think the statistics for those countries bear that out. They've all improved their positions. Some are still very heavily dependent upon oil, and I'm convinced that if the price of oil should go up above $29 a barrel that this would increase the stimulus for further efforts to remove the dependence upon oil. Efforts in those countries to improve their position with regard to nuclear, renewables, conservation, and coal have all been taking place at accelerated rates and I think at $29 a barrel there still is substantial incentive to do that. But the effects in 1984, what we will see will be depending upon the rate of the economic recovery, oil price developments, the strength of efficiency gains and fuel-switching, the relative strength of the dollar against other currencies, the weather, and many other factors. As you know, because of the tremendous strengthening of the dollar, some of our allies have, in fact, not seen the drop in oil prices that the nominal pricing change would indicate so they, in fact, have seen a very modest decrease. In some cases they have actually not seen a decrease at all because the dollar has strengthened so much compared to their own monetary systems.


GREENLAND
ALASKA
NORTH AMERICA
UNITED STATES
HAWAII
SOUTH AMERICA
Atlantic Ocean
WESTERN EUROPE
Mediterranean Sea
AFRICA
IRAN
IRAQ
QATAR
UNITED ARAB EMIRATES
ASIA
JAPAN
Pacific Ocean
Arabian Sea
Indian Ocean
AUSTRALIA
.5 MMBD
3.0 MMBD
2.6 MMBD
OTHER OECD
.2 MMBD
OTHER NON-OPEC
2.6 MMBD

The chart that I have before you right now is a picture of the current supply out of the Persian Gulf area, and as that chart indicates, the United States is relatively slightly dependent upon the gulf area directly. Our allies, however, are much more severely dependent upon it. Japan is in excess of 50 percent. European countries in the neighborhood of 25 to 30 percent. And as a result, we cannot ignore what happens in the Persian Gulf, even though we ourselves are not particularly heavily dependent upon it.

The combined effects of declining oil consumption, non-OPEC production gains and the liquidation of inventories have been dramatic. OPEC crude oil production fell in 1983 to an estimated 17.6 million barrels a day. That's the lowest level since 1967 and nearly 13 million barrels below the 1977 peak OPEC production level. OPEC's share of free world oil supplies dropped from 62 to 40 percent. Crude oil output in Saudi Arabia, which is the swing producer for OPEC, averaged only about 4.1 million barrels per day during the first half of 1983.

WORLD CRUDE OIL PRODUCTION : EXCESS CAPACITY AVAILABLE FOR EXPORT



As a result of these drops the next chart indicates that world crude oil production has excess capacity available for export in excess of 10 million barrels a day. Now that cannot be taken without some qualification because 7 million barrels a day of that production capacity is in the Persian Gulf, and depending upon the kind of interruption that occurs, that may not be available to the world market. We look at the alternatives, the alternatives which theoretically can block off all production from the gulf. In the gulf states clearly there is not a belief that a long-term interruption of supply from the whole of the gulf is likely. There are lesser interruptions that are possible, such as interference with the Iranian capability from Kharg Island, interference with the various producing or shipping facilities of some of the other gulf states. If any of those lesser events took place and the gulf remained open, presumably some of that excess production capacity represented by the gulf would still be available to the free world. So that it seems if we have an interruption, other than a full interruption of the gulf, there remains the significant opportunity for production capacity to increase from other available storage capacity. We start off with 3 to 3½ million barrels outside the gulf which would be available.

Consumption is lagging outside of the United States. Market perceptions now surfacing say OPEC production may have risen too high too quickly resulting in unwanted inventory accumulation during the fourth quarter of 1983. This has been reflected most recently in a retreat of most spot crude prices, and some official prices in spite of the temporary firmness associated with the cold snap in North America.

One of the concerns I know that was expressed to me was that if the reserves that were held for the winter usage were not consumed during this winter and became once again available in the market this spring OPEC would face the same kind of downward pressure on prices that they faced last year because you have not only the combination of the excess production capacity, but a reduction of inventories by those holding those inventories. The high cost of holding an inventory is something most companies cannot maintain. They will put it on the market and that results in further possible reductions in production.

The current situation in the world oil market is therefore somewhat similar to last year at this time. However, expectations of the world oil price decline are probably not as high as they were last year. The difference between the spot and the official sales prices, currently less than $1 per barrel, is nowhere near the $5 to $6 per barrel difference prevailing last year. Commercial inventories are lower and it appears that Mexico has been producing about 1.5 million barrels a day, less than the amount that they might be capable of producing, which has the further effect of diminishing the excess supply in the market.

It's our present view that OPEC crude oil production might have to decline to approximately 17 million barrels a day during the second quarter of 1984 with the strong possibility that production might have to be even lower than that for a short period of time. Again that will be dependent upon what happens to inventories and consumption curves at the same time.

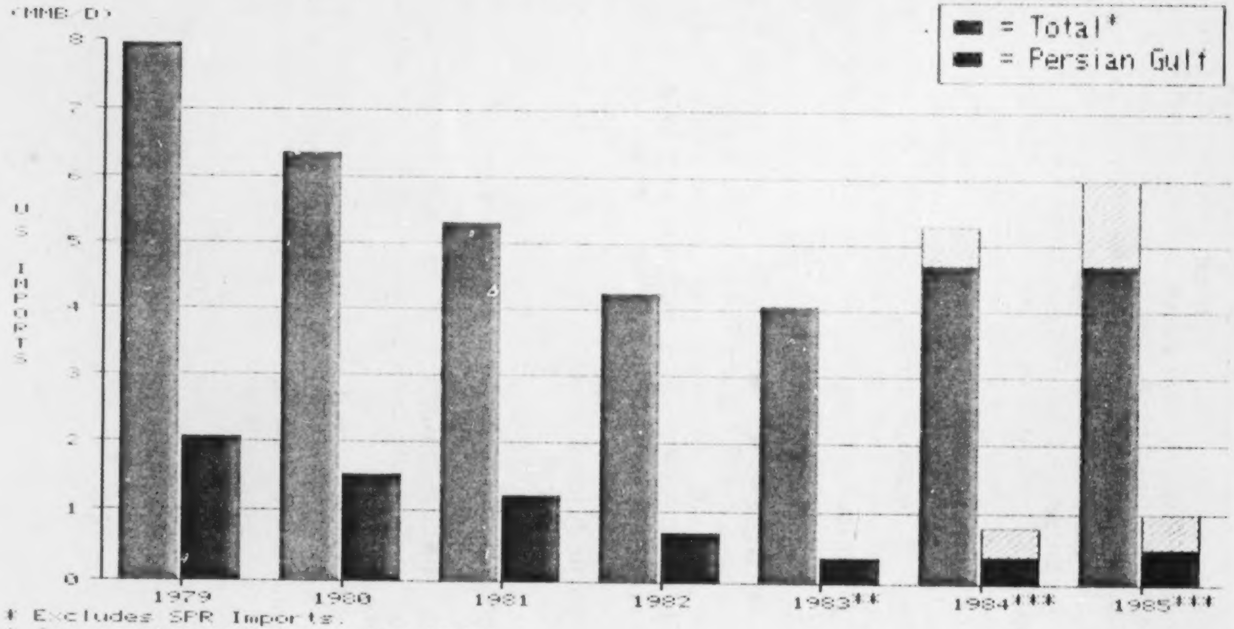
Given these circumstances and the deteriorating financial position of a number of OPEC producers, Saudi Arabia may be forced to bear the volumetric brunt of lower production if it wishes to avoid a price decline. I've said on numerous occasions they are determined to do it, they have the capability to reduce production sufficiently to maintain that price. If they can afford to do that and if their own domestic situation will permit it, it remains to be seen whether they can do that for any sustained period of time.

We expect OPEC production to be slightly higher on average for 1984 in spite of the early month reductions, partly reflecting the increased consumption that we see, especially in the United States. The strains of maintaining production discipline on OPEC members are likely to continue throughout this year and by the same token most of the members of OPEC recognize the consequences to them if they significantly exceed the production quotas or sharply reduce their own prices.

With regard to inventories, the total free world oil inventories have declined from about 4.8 billion barrels at the beginning of 1979, to just under 4.5 billion barrels by the end of 1983. Free world oil consumption, however, has declined as well. In 1979 with oil consumption at about 52.5 million barrels a day we had a higher reserve requirement than is now needed. A useful comparative statistic is the relative days of consumption applied by these stock and consumption levels which are about 92 days at the beginning of 1979 compared to about 100 days at the end of 1983. Although that's a modest 8 days, it is a tremendous volume of oil and consumption shifts in order to bring that about. Although the minimum operating levels are taken into account in days of coverage calculations, these minimum requirements move with changes in consumption so that the days coverage remains a useful indicator of stock adequacy.

In the United States we have a number of important trends. U.S. oil demand and oil imports have remained well below the peak of the 1970's and the United States is now much less reliant on oil to meet its energy requirements.

U.S. Net Petroleum Imports



* Excludes SPR Imports.
** January through September 1983
*** Projected range.

The next chart shows U.S. net imports. The two right hand columns are projections. The second from the right column is 1984 and the last column is 1985. The cross-hatch portion of each of those columns represents the range of projections. We are not attempting to say that we'll be at the top or the bottom of those lists, but our present estimates are somewhere between which in 1984 would indicate that our imports might range somewhere between 4.7 and 5.2 million barrels per day, and in 1985 somewhere between 4.7 and 6 million barrels per day depending on a number of things not now known to any of us.

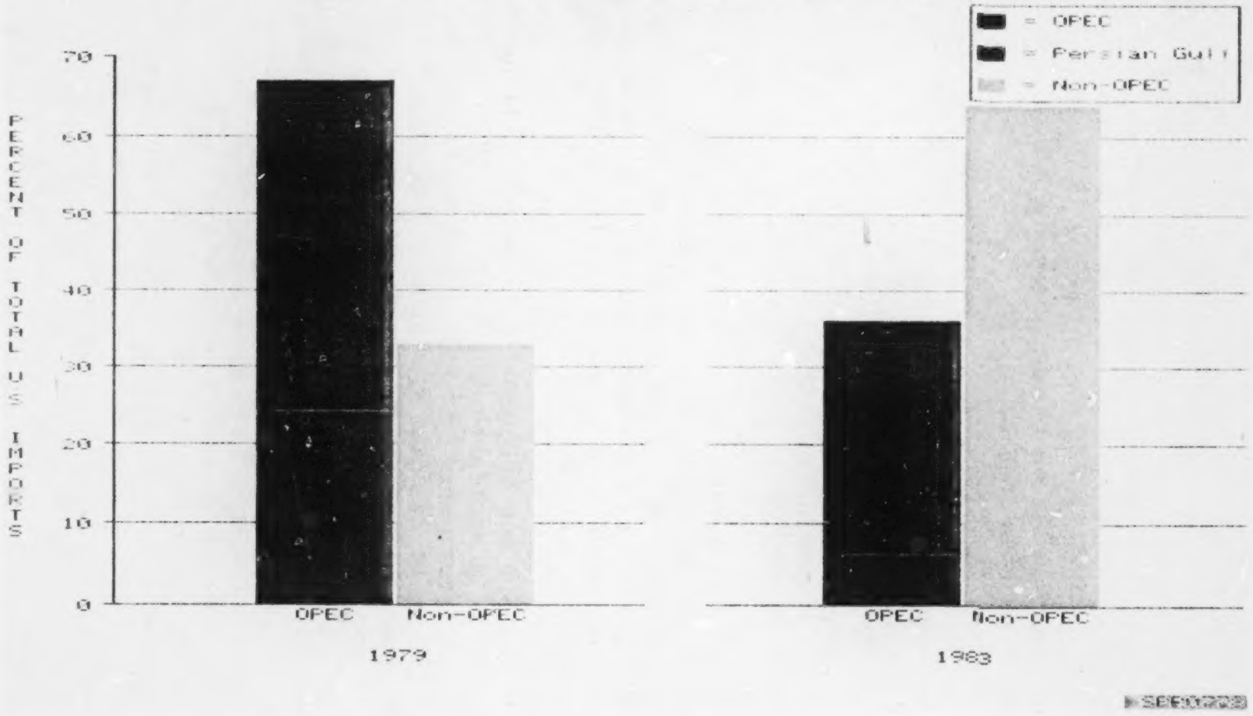
The same is true with regard to the dark blue line on that chart which indicates the level of imports from the Persian Gulf. As you can see they can go anywhere in our estimates in 1984 from 300,000 or 400,000 up to 500,000 or 600,000 barrels a day. And similarly in 1985 from approximately 500,000 barrels a day up to a million, depending on circumstances not known to us.

There are a few statistics that I think may be useful to show the magnitude of changes in the U.S. oil consumption. In 1983, our oil consumption was estimated to be 15.1 million barrels per day which is down slightly from the 15.3 million barrels a day the year before. That's the lowest annual consumption figure since 1970.

It's estimated that U.S. net oil imports in 1983 were about 4 million barrels per day without including the strategic petroleum reserve which raises that by about 200,000 barrels a day. A very slight decrease from the 1982 level, but less than half the amount we were importing in 1977.

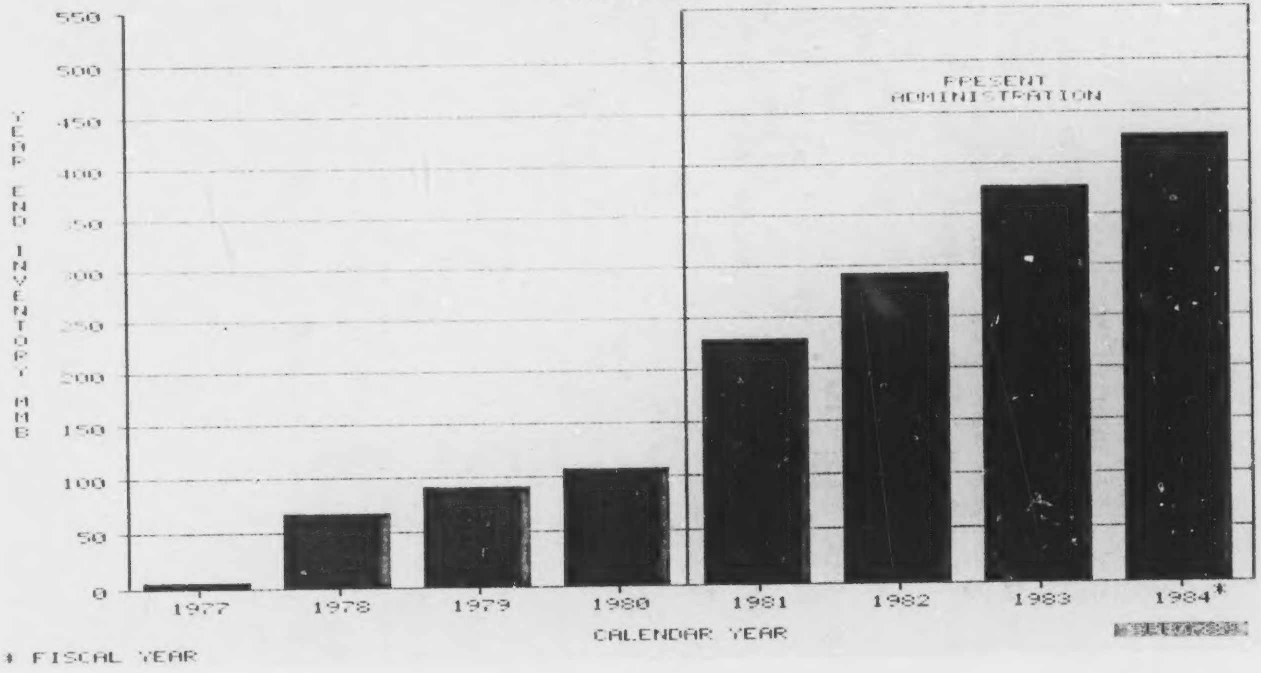
Last year oil imports provided an estimated 12 percent of U.S. total energy consumption compared to 24 percent in 1977. We can expect some increase as economic recovery continues, but we do believe that we've unlocked the historic lock step relationship between energy consumption growth and gross national product growth, and we anticipate that we will not see energy grow as rapidly as the growth in gross national product. We think we will see differences within the energy sector as rates of growth occur. We believe that we will see a less rapid increase in oil consumption than in other areas in energy consumption or conservation as a means of meeting the energy component or increased gross national product. Our reliance on OPEC oil has fallen significantly. As this chart will indicate, in 1979 OPEC represented two-thirds of our imports, 67 percent. The Persian Gulf portion represented about 25 percent. In 1983, we've tipped that chart almost around completely, and almost two-thirds, slightly more than 62–64 percent of our dependence is on non-OPEC sources. That is significant as it relates to United States direct dependence on the gulf, but I need to keep emphasizing, and I try to do this every chance I get, that because of the interrelated nature of the world oil market, whether we were members of IEA or not, what happens in the gulf will tremendously affect our country, our economy, because it affects our trading partners and our allies very directly and very significantly.

SHIFTING U.S. OIL IMPORT DEPENDENCE



STRATEGIC PETROLEUM RESERVE

YEAR END INVENTORIES
SINCE
PROGRAM INCEPTION
(CUMULATIVE)



* FISCAL YEAR

Another important measure for energy security is our strategic petroleum reserve. We have just reached 385 million barrels of oil in the strategic petroleum reserve which is 10 million barrels above the halfway mark. We are committed to a 750 million barrel level. That provides us approximately 90 days protection from the strategic petroleum reserve. It equals a thousand days of interruption of our estimated 1983 imports from the gulf.

In the blue sector of the chart, the right hand portion shows 1981, 1982, 1983, and 1984. Of course, 1984 is a projection, but it shows us at the end of this fiscal year to be at 429 million barrels of oil which assumes completion of this year at the average fill rate of 186,000 barrels a day that we are really pursuing to the budget plan.

At the present rate of anticipated growth in oil imports, the growth of the strategic petroleum reserve will continue to provide us with approximately 90 days supply and protection, which appears to be the target that we have set ourselves in the Nation, because we have targeted 750 million barrels, about twice this amount, when we thought the imports would be twice or more what they are today.

Finally, Mr. Chairman, I think I should talk about the threat of disruption. The threat of disruption in the Middle East is essentially imponderable. You can raise all kinds of scenarios and thoughts about how it could occur and what might occur. Certainly there is no way to predict that there will be peace and quiet in that area, but the scenarios for disruption are as wide ranging as the human imagination. Certainly my experience in visiting there caused me to believe there's a general expectation that there will be efforts at disruption. There is also a general expectation that severe long-term disruptions out of the gulf would be very difficult to maintain unless basic production facilities are destroyed in the process.

With that, Mr. Chairman, I conclude and attempt to respond to questions of the committee.

[The prepared statement of Secretary Hodel follows:]

STATEMENT OF DONALD PAUL HODEL
SECRETARY OF ENERGY
BEFORE
THE SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
JANUARY 30, 1984

THE WORLD PETROLEUM OUTLOOK FOR 1984

MR. CHAIRMAN AND DISTINGUISHED MEMBERS OF THE COMMITTEE.

I WELCOME THIS OPPORTUNITY TO PRESENT THE DEPARTMENT OF ENERGY'S VIEWS ON THE WORLD OIL SITUATION AND OUTLOOK.

THESE HEARINGS COME AT AN INTERESTING JUNCTURE IN THE OIL MARKET. ON THE ONE HAND, IN SPITE OF A LEVELING OFF OF THE DECLINE IN WORLD OIL DEMAND AND THE POSSIBILITY THAT 1984 WILL PRODUCE THE FIRST YEARLY INCREASE IN WORLD OIL CONSUMPTION SINCE 1979, THE FUNDAMENTAL UNDERLYING SOFTNESS OF THE OIL MARKET IS EXPECTED TO CONTINUE FOR A NUMBER OF YEARS TO COME, ABSENT A SIGNIFICANT DISRUPTION OF WORLD OIL SUPPLIES. THE POSSIBILITY OF A CUT IN NOMINAL OIL PRICES CANNOT BE RULED OUT. THIS SEASONAL DROP IN DEMAND COUPLED WITH THE GROWING FINANCIAL REQUIREMENTS OF A NUMBER OF PRODUCING COUNTRIES, THE UNCERTAINTIES SURROUNDING THE RECENT MILITARY TAKE-OVER IN NIGERIA, AND THE CONTINUED INCREASE IN NON-OPEC OIL PRODUCTION MAY CREATE A CLIMATE THAT WILL MAKE IT DIFFICULT FOR THE OPEC MEMBERS TO MAINTAIN THE PRODUCTION DISCIPLINE NECESSARY TO PREVENT FURTHER CUTS IN OIL PRICES.

ON THE OTHER HAND, IN SPITE OF THE EXISTENCE OF A LARGE MARGIN OF SPARE OIL PRODUCTION CAPACITY, THERE ARE SOME THINGS GOING ON IN THE WORLD THAT COULD OVERTURN THE FUNDAMENTAL UNDERLYING WEAKNESS IN THE MARKET THAT I HAVE JUST DESCRIBED; THE CONTINUING INSTABILITY IN THE MIDDLE EAST AND POSSIBLE ESCALATION OF THE IRAN-IRAQ WAR BEING CHIEF AMONG THEM.

I WOULD LIKE TO BRIEFLY REVIEW OUR PROJECTIONS AND ANALYSIS OF THE OUTLOOK FOR WORLD OIL SUPPLY AND DEMAND THROUGH 1984 WHICH IS DETAILED IN THE TABLES ACCOMPANYING MY STATEMENT. I WANT TO EMPHASIZE THAT ANY PROJECTION OF WORLD OIL SUPPLY, DEMAND, AND PRICE IS FRAUGHT WITH UNCERTAINTY, AND OUR PROJECTIONS ARE JUST AS TENUOUS. WHAT WE OFFER IS AN ANALYSIS OF THE VARIABLES RELEVANT TO THE NEAR-TERM OUTLOOK. WE ARE NOT ATTEMPTING TO FORECAST THE OUTCOME OF EVENTS, OR TO CONVINCE YOU THAT OUR CRYSTAL BALL IS ANY LESS CLOUDED THAN ANYONE ELSE'S.

THE PROSPECTS FOR 1984 ALLOW US TO FACE OUR ENERGY FUTURE WITH CONFIDENCE. OUR POLICIES HAVE LED TO A U.S. ENERGY SYSTEM LESS DEPENDENT ON OIL AND WITH GREATER GEOGRAPHICAL DIVERSITY OF EXTERNAL SUPPLY SOURCES. IN THE COMING YEARS, OUR POLICIES, IF GIVEN TIME TO WORK, COULD LEAD TO A MORE COMFORTABLE AND MORE SECURE ENERGY POSTURE. YET AS OUR ECONOMY RECOVERS ITS VIGOR, THERE IS NOT ROOM FOR COMPLACENCY.

FOR THIS REASON, WE NOT ONLY HAVE DEVELOPED THE NATIONAL ENERGY POLICY PLAN BUT HAVE JOINED OUR ALLIES INTERNATIONALLY WITHIN THE INTERNATIONAL ENERGY AGENCY TO DIRECT OUR ENERGY SYSTEMS COLLECTIVELY AWAY FROM AN UNDUE RELIANCE ON OIL AND OTHER INSECURE ENERGY SOURCES. WE ARE WORKING TOGETHER WITHIN THE IEA TO PROMOTE, OVER THE MEDIUM AND LONG TERM, EFFICIENT, BALANCED AND MIXED ENERGY SYSTEMS, WHILE PRESERVING FOR OUR INDIVIDUAL CITIZENS FREE CHOICE AMONG A RANGE OF ENERGY OPTIONS.

CONSUMPTION

THE SLIDE IN FREE WORLD OIL CONSUMPTION WHICH BEGAN IN THE AFTERMATH OF THE IRANIAN REVOLUTION CONTINUED THROUGHOUT 1983. THE ONGOING EFFECTS OF WEAK ECONOMIC GROWTH OUTSIDE THE UNITED STATES, PRICE-INDUCED CONSERVATION AND SUBSTITUTION, AND MILDER THAN NORMAL TEMPERATURES THROUGHOUT MOST OF THE YEAR RESULTED IN A 1983 DECLINE IN FREE WORLD OIL CONSUMPTION OF 1.0 MILLION BARRELS PER DAY (MMBD), OR ABOUT 2 PERCENT. THIS DECLINE FOLLOWED DECLINES OF 1.7 MMBD AND 2.1 MMBD IN 1982 AND 1981, RESPECTIVELY, BRINGING THE TOTAL DROP IN FREE WORLD OIL CONSUMPTION TO 7.7 MMBD FROM THE PEAK CONSUMPTION LEVEL OF 52.4 MMBD REACHED IN 1979. THE DECLINE IN OIL CONSUMPTION IN THE OECD (ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT) REGION LAST YEAR ACCOUNTED FOR VIRTUALLY ALL OF THE WORLD DECLINE AND BROUGHT OECD OIL CONSUMPTION TO ITS LOWEST LEVEL IN 13 YEARS.

ONE NOTEWORTHY EVENT IS THE FACT THAT OECD OIL CONSUMPTION CONTINUED TO DECLINE LAST YEAR EVEN THOUGH ITS REAL GNP GREW BY MORE THAN 2.0 PERCENT. THIS FACT ATTESTS TO THE CONTINUING STRENGTH OF EFFICIENCY GAINS AND FUEL-SWITCHING IN THE VARIOUS OECD COUNTRIES, I.E., TO THE INDUSTRIALIZED NATONS' SIZEABLE LONG-TERM PRICE ELASTICITY OF DEMAND. IT ALSO IS A CLEAR INDICATION THAT THE PRESENT PRICE OF $29 PER BARREL IS SUFFICIENT MARKET INCENTIVE TO MAINTAIN THE INDUSTRIALIZED NATIONS' DEMONSTRATED RESOLVE TO CONTINUE TO REDUCE THEIR DEPENDENCE ON

OIL IN THEIR OVERALL ENERGY MIX. TO GIVE JUST ONE EXAMPLE, THE NUCLEAR GENERATING CAPACITY IN THE OECD COUNTRIES OUTSIDE THE UNITED STATES HAS RISEN FROM 54,000 MW IN 1979 TO 85,000 MW IN 1983, SQUEEZING THE EQUIVALENT OF 300 MILLION BARRELS PER YEAR OUT OF OIL IMPORTS AND OTHER FUELS. OF THE 24 OECD NATIONS FINLAND, BELGIUM AND FRANCE HAVE REACHED OR EXCEEDED 40 PERCENT OF THEIR ELECTRICITY GENERATION THROUGH NUCLEAR PLANTS, COMPARED TO 13 PERCENT IN THE UNITED STATES.

THE OUTLOOK FOR WORLD OIL CONSUMPTION IN 1984 REMAINS DEPENDENT ON THE TIMING AND PACE OF THE ECONOMIC RECOVERY, OIL PRICE DEVELOPMENTS, THE STRENGTH OF EFFICIENCY GAINS AND FUEL-SWITCHING, THE RELATIVE STRENGTH OF THE DOLLAR AGAINST OTHER CURRENCIES, THE WEATHER, AND MANY OTHER FACTORS.

A PROJECTED STRENGTHENING OF ECONOMIC RECOVERY IN 1984 (+3.5 PERCENT REAL GNP GROWTH IN THE OECD REGION) MAY CAUSE OECD PRIMARY ENERGY CONSUMPTION TO RISE BY 1.5-2.0 MMBD OIL EQUIVALENT. DURING THIS PERIOD, NON-OIL ENERGY USE IS PROJECTED TO INCREASE BY ABOUT 1.0 MILLION BARRELS PER DAY EQUIVALENT (MMBD), RESULTING IN A SLIGHT INCREASE OF OECD OIL CONSUMPTION OF ABOUT 0.5 TO 1.0 MMBD, DEPENDING ON THE FACTORS PREVIOUSLY MENTIONED.

MOST OF THE PROJECTED INCREASE IN OECD OIL CONSUMPTION IS EXPECTED TO BE CONCENTRATED IN THE UNITED STATES, WHICH IS LEADING THE REST OF THE WORLD IN THE PRESENT ECONOMIC RECOVERY. OIL CONSUMPTION IN EUROPE AND JAPAN IS EXPECTED TO BE LARGELY UNCHANGED FROM 1983.

THE RISING FOREIGN EXCHANGE VALUE OF THE DOLLAR HAS BEEN AN IMPORTANT FACTOR RETARDING OIL CONSUMPTION IN MANY COUNTRIES DURING THE PAST YEAR. IN FRANCE, GERMANY, AND ITALY, CURRENCY EFFECTS ALONE HAVE RAISED THE LOCAL CURRENCY COSTS OF OPEC CRUDE OIL FROM $29 PER BARREL IN MARCH OF LAST YEAR TO THE EQUIVALENT OF $32.70 PER BARREL IN FRANCE AND ITALY, AND TO ABOUT $32.15 PER BARREL IN GERMANY BY THE END OF 1983, OFFSETTING MUCH OF THE PRICE CUT BY OPEC LAST SPRING. INFLATION HAS MODERATED THIS TREND SOMEWHAT, BUT REAL PRICES IN LOCAL CURRENCY TERMS ARE NOW HIGHER IN MANY COUNTRIES THAN THEY WERE LAST SPRING IMMEDIATELY AFTER THE OPEC PRICE REDUCTION.

IN SUMMARY, WITH THE ONSET OF STRONGER ECONOMIC GROWTH AND GRADUAL DILUTION OF THE EFFECTS OF PAST PRICE INCREASES, THE PATTERN OF YEARLY OIL CONSUMPTION DECLINES MAY REVERSE ITSELF IN 1984. FREE WORLD OIL CONSUMPTION COULD INCREASE BY 1 TO 2 PERCENT THIS YEAR UNDER THESE CIRCUMSTANCES, OR POSSIBLY MORE IF THERE IS A STRONG RECOVERY IN INDUSTRIAL OUTPUT OR A WEAKENING OF THE DOLLAR VIS-A-VIS OTHER CURRENCIES.

OIL PRODUCTION

NON-OPEC OIL SUPPLIES ROSE AT AN AVERAGE ANNUAL RATE OF NEARLY 1 MMBD PER YEAR IN THE SIX YEARS FROM 1977 TO 1983, AND THEY ARE EXPECTED TO RISE BY AN ADDITIONAL 0.4 TO 0.9 MMBD IN 1984. MOST OF THE PAST INCREASES OCCURRED IN THE NORTH SEA AND MEXICO, BUT THERE WERE ALSO SIGNIFICANT GAINS IN EGYPT

AND OTHER DEVELOPING COUNTRIES. THE MAINTENANCE OF HIGH LEVELS OF OIL PRODUCTION IN THE UNITED STATES, AGAINST EARLIER EXPECTATIONS OF A GRADUAL DECLINE, HAS ALSO CONTRIBUTED TO THE OVERALL STRENGTH OF NON-OPEC SUPPLIES.(U)

THE COMBINED EFFECTS OF DECLINING OIL CONSUMPTION, NON-OPEC PRODUCTION GAINS, AND LIQUIDATION OF INVENTORIES HAVE BEEN DRAMATIC:

- OPEC CRUDE OIL PRODUCTION FELL IN 1983 TO AN ESTIMATED 17.6 MMBD, THE LOWEST LEVEL SINCE 1967, AND NEARLY 13 MMBD BELOW THE 1977 PEAK OPEC PRODUCTION LEVEL;
- OPEC'S SHARE OF FREE WORLD OIL SUPPLIES FELL TO 40 PERCENT IN 1983 FROM 62 PERCENT IN 1977; AND
- CRUDE OIL OUTPUT IN SAUDI ARABIA, OPEC'S "SWING" PRODUCER, AVERAGED ONLY 4.1 MMBD DURING THE FIRST HALF OF 1983, LESS THAN HALF THE 9.6 MMBD AVERAGE PRODUCTION LEVEL REACHED IN 1981.

THE GRADUAL CESSATION OF INVENTORY LIQUIDATION AND THE SWING TOWARD INVENTORY BUILD THAT OCCURRED BETWEEN THE SECOND AND THIRD QUARTERS OF 1983, COUPLED WITH STRONGER SEASONAL CONSUMPTION ALLOWED OPEC CRUDE OIL PRODUCTION TO RECOVER FROM THE LOW OF 16.4 MMBD EXPERIENCED IN THE FIRST HALF OF 1983 TO AN ESTIMATED LEVEL OF 18.8 MMBD IN THE SECOND-HALF OF THE YEAR, NOTWITHSTANDING THE MARCH 1983 OPEC ACCORDS WHICH PLACED A 17.5 MMBD CEILING ON OPEC CRUDE OIL PRODUCTION. INVENTORY DRAWDOWN IN ANTICIPATION OF THE MARCH 1983 PRICE CUT CONTRIBUTED TO THE DEPRESSED LEVEL OF PRODUCTION IN THE FIRST HALF OF 1983.

WITH CONSUMPTION LAGGING ALMOST EVERYWHERE OUTSIDE THE UNITED STATES, MARKET PERCEPTIONS ARE NOW SURFACING THAT OPEC PRODUCTION MAY HAVE RISEN TOO HIGH, TOO QUICKLY, RESULTING IN UNWANTED INVENTORY ACCUMULATION DURING THE FOURTH QUARTER OF 1983. THIS HAS BEEN REFLECTED MOST RECENTLY IN A RETREAT OF MOST SPOT CRUDE PRICES, AND SOME OFFICIAL PRICES, IN SPITE OF THE TEMPORARY FIRMNESS ASSOCIATED WITH THE COLD SNAP IN NORTH AMERICA.

OPEC PRODUCTION HAS REMAINED HIGH THUS FAR IN 1984. THIS, ALONG WITH THE RESULTING EXTRA INVENTORY AND COMING SEASONAL DOWNTURN IN CONSUMPTION, COULD ONCE AGAIN BECOME AN IMPORTANT FACTOR CONTRIBUTING TO WEAKNESS IN OIL PRICES AND DOWNWARD PRESSURE ON OPEC PRODUCTION IN THE NEXT FEW MONTHS. THE CURRENT SITUATION IN THE OIL MARKET IS SOMEWHAT SIMILAR TO THE SITUATION LAST YEAR AT THIS TIME, WITH SEVERAL IMPORTANT DIFFERENCES, NOTABLY:

- EXPECTATIONS OF AN OIL PRICE DECLINE DO NOT APPEAR TO BE AS WIDESPREAD THIS YEAR;
- THE DIFFERENCE BETWEEN SPOT AND OFFICIAL SALES PRICES, CURRENTLY LESS THAN $1.00 PER BARREL, IS NOWHERE NEAR THE $5-$6 PER BARREL DIFFERENCE PREVAILING LAST YEAR;
- COMMERCIAL INVENTORIES ARE LOWER THIS YEAR, MAKING IT LESS LIKELY THAT THE INDUSTRY COULD SUSTAIN THE MASSIVE DRAWDOWN AND DROP IN CRUDE LIFTINGS THAT OCCURRED LAST YEAR; AND

° MEXICO HAS ADOPTED A POLICY OF SUPPORT FOR THE OPEC ACCORDS BY LIMITING ITS EXPORTS TO 1.5 MMBD.

NEVERTHELESS, IN ORDER TO PREVENT EXTREME DOWNWARD PRESSURE ON OIL PRICES, IT IS OUR PRESENT VIEW THAT OPEC CRUDE OIL PRODUCTION MIGHT HAVE TO DECLINE TO APPROXIMATELY 17.0 MMBD DURING THE SECOND QUARTER OF 1984, WITH A STRONG POSSIBILITY THAT PRODUCTION WOULD HAVE TO BE EVEN LOWER FOR A SHORT PERIOD OF TIME. GIVEN THESE CIRCUMSTANCES AND THE DETERIORATING FINANCIAL POSITION OF A NUMBER OF OPEC PRODUCERS, SAUDI ARABIA MAY BE FORCED TO BEAR THE VOLUMETRIC BRUNT OF LOWER PRODUCTION IF IT WISHES TO AVOID A PRICE DECLINE, EVEN IF THE OTHER OPEC MEMBERS ADHERE TO THEIR PRODUCTION CEILINGS. PRODUCTION IN EXCESS OF THE AGREED QUOTAS BY ONE OR SEVERAL OPEC PRODUCERS WOULD PLACE AN EVEN GREATER BURDEN ON SAUDI ARABIA IN ITS ROLE AS SWING PRODUCER AND INCREASE THE POSSIBILITY OF A DECLINE IN PRICES.

WHILE WE EXPECT OPEC PRODUCTION TO BE SLIGHTLY HIGHER ON AVERAGE FOR 1984 AS A WHOLE, OPEC PRODUCTION IS LIKELY TO REMAIN FAR BELOW THEIR DESIRED LEVELS AND SUBJECT TO SUBSTANTIAL FLUCTUATIONS WITH SEASONAL CHANGES IN CONSUMPTION AND INDUSTRY PERCEPTIONS OF INVENTORY REQUIREMENTS. THE STRAINS OF MAINTAINING PRODUCTION DISCIPLINE AMONG OPEC MEMBERS ARE LIKELY TO CONTINUE THROUGHOUT THIS YEAR; THEY WILL BE ESPECIALLY PRONOUNCED IN THE MONTHS IMMEDIATELY AHEAD.

ONE NOTEWORTHY CASE WORTH MENTIONING IS THE JANUARY 1, 1984, MILITARY TAKE-OVER IN NIGERIA LED BY MAJOR GENERAL

MUHAMMADU BUHARI, WHO SERVED AS MINISTER OF PETROLEUM AND CHAIRMAN OF THE NIGERIAN NATIONAL PETROLEUM COMPANY (NNPC) IN THE MILITARY GOVERNMENT WHICH RULED NIGERIA JUST PRIOR TO THE NOW DEPOSED CONSTITUTIONAL GOVERNMENT.

BUHARI HAS CITED SEVERE ECONOMIC PROBLEMS AS ONE OF THE MAIN REASONS FOR THE TAKE-OVER. AT THE SAME TIME, HE HAS REAFFIRMED HIS COUNTRY'S COMMITMENT TO BOTH THE INTERNATIONAL OIL AND FINANCIAL COMMUNITIES THAT CURRENT OBLIGATIONS BE MET; BUHARI HAS ALSO STATED HIS INTENTION TO KEEP NIGERIA IN OPEC.

INVENTORIES

ANOTHER FACTOR WHICH HAS AN IMPORTANT IMPACT ON CRUDE OIL PRICES AND PRODUCTION LEVELS IS THE PATTERN OF INVENTORY BEHAVIOR. ALTHOUGH TOTAL FREE WORLD OIL INVENTORIES HAVE DECLINED FROM ABOUT 4,800 MILLION BARRELS AT THE BEGINNING OF 1979 TO ABOUT 4,490 MILLION BARRELS BY THE END OF 1983, FREE-WORLD OIL CONSUMPTION HAS DECLINED AS WELL. IN 1979 FREE-WORLD OIL CONSUMPTION EQUALLED ABOUT 52.4 MILLION BARRELS PER DAY WHILE CONSUMPTION IN 1983 HAS DECLINED TO ABOUT 45.0 MMBD. A USEFUL COMPARATIVE STATISTIC IS THE RELATIVE DAYS OF CONSUMPTION IMPLIED BY THESE STOCK AND CONSUMPTION LEVELS, WHICH ARE ABOUT 92 DAYS AT THE BEGINNING OF 1979 COMPARED TO ABOUT 100 DAYS AT THE END OF 1983. ALTHOUGH MINIMUM OPERATING LEVELS ARE TAKEN INTO ACCOUNT IN DAYS COVERAGE, THESE MINIMUM REQUIREMENTS MOVE WITH CHANGES IN CONSUMPTION, SO THAT DAYS COVERAGE REMAINS A USEFUL INDICATOR OF STOCK ADEQUACY.

STOCK LEVELS IN THE U.S. FOR THE SAME PERIOD HAVE SHOWN AN EVEN MORE FAVORABLE TREND, AS STOCKS ACTUALLY INCREASED FROM 1,278 MILLION BARRELS AT THE BEGINNING OF 1979 TO AN ESTIMATED 1,480 MILLION BARRELS AT THE BEGINNING OF 1984. CONSUMPTION DURING THE SAME PERIOD DROPPED FROM 18.5 MMBD IN 1979 TO 15.1 MMBD IN 1983, SHOWING AN INCREASE IN STOCKS, MEASURED IN DAYS OF CONSUMPTION, FROM ABOUT 70 AT THE BEGINNING OF 1979 TO ABOUT 98 IN THE BEGINNING OF 1984. THESE GROSS STOCK LEVELS INCLUDE BOTH STOCKS HELD BY COMPANIES ESSENTIAL TO THE OPERATION OF THE PETROLEUM DISTRIBUTION SYSTEM AND THE SPR, AND THEREFORE CANNOT BE USED AS A MEASURE OF TOTAL AVAILABILITY IN THE CASE OF A DISRUPTION. THEY DO, HOWEVER, GIVE A GOOD INDICATION OF HOW THE RELATIONSHIP BETWEEN STOCK LEVELS AND DEMAND HAS IMPROVED IN THE U.S. OVER THE PAST FIVE YEARS.

INDUSTRY INVENTORY BEHAVIOR FOR 1984 IS HIGHLY UNCERTAIN. THEREFORE, THE ATTACHED PROJECTIONS ARE BASED ON THE ASSUMPTION THAT THE MARKET CONDITIONS THAT WERE THE DRIVING FORCE BEHIND COMMERCIAL INVENTORY LIQUIDATION OVER THE PAST TWO YEARS REMAIN IN PLACE TO PRODUCE A SLIGHT FURTHER DECLINE IN COMMERCIAL INVENTORIES. THE OPPOSITE, HOWEVER, COULD OCCUR. THIS DECLINE IS ASSUMED TO BE ROUGHLY OF THE SAME MAGNITUDE AS THE PROJECTED INCREASE IN GOVERNMENT STRATEGIC RESERVES.

THE U.S. PETROLEUM SITUATION

IN THE U.S. OIL MARKET WE HAVE WITNESSED A NUMBER OF IMPORTANT TRENDS:

- U.S. OIL DEMAND AND OIL IMPORTS HAVE REMAINED WELL BELOW THE PEAK LEVELS REACHED IN THE LATE SEVENTIES, AND THE U.S. IS NOW MUCH LESS RELIANT ON OIL TO MEET ITS ENERGY REQUIREMENTS;

- THE SOURCE OF OUR OIL IMPORTS HAS BEEN DIVERSIFIED SIGNIFICANTLY OVER THE LAST FEW YEARS, REDUCING OUR PREVIOUS PREDOMINANT RELIANCE ON OPEC OIL; AND
- THE U.S. STRATEGIC OIL RESERVE HAS GROWN TO THE POINT WHERE IT NOW PROVIDES A NOT INSIGNIFICANT DEGREE OF INSURANCE AGAINST THE CONSEQUENCES OF MAJOR DISRUPTIONS.

A FEW STATISTICS WILL ILLUSTRATE THE MAGNITUDE OF THESE CHANGES. U.S. OIL DEMAND FOR THE WHOLE OF 1983 IS ESTIMATED TO HAVE BEEN 15.1 MILLION BARRELS PER DAY, DOWN SLIGHTLY FROM 15.3 MMBD THE YEAR BEFORE. THIS IS THE LOWEST ANNUAL CONSUMPTION FIGURE SINCE 1970. IT IS ESTIMATED THAT U.S. NET OIL IMPORTS IN 1983 WERE ABOUT 4.0 MILLION BARRELS PER DAY (4.2 MMBD INCLUDING IMPORTS FOR THE STRATEGIC PETROLEUM RESERVE), A VERY SLIGHT DECREASE FROM THE 1982 LEVEL, BUT LESS THAN HALF THE AMOUNT WE WERE IMPORTING IN 1977. LAST YEAR OIL IMPORTS PROVIDED AN ESTIMATED 12 PERCENT OF U.S. ENERGY CONSUMPTION, COMPARED TO 24 PERCENT IN 1977.

WHILE SOME INCREASE IN U.S. OIL DEMAND AND IMPORTS CAN BE EXPECTED AS THE ECONOMIC RECOVERY PROCEEDS, SIGNIFICANT IMPROVEMENTS HAVE OCCURRED IN ENERGY EFFICIENCY WHICH WILL DAMPEN THE RESPONSE OF OIL DEMAND TO ECONOMIC GROWTH. FURTHER USE OF DOMESTICALLY PRODUCED FUELS SUCH AS NATURAL GAS COULD OCCUR, ALSO DAMPENING MARKET DEMAND. NEVERTHELESS, WE NOW EXPECT

U.S. OIL CONSUMPTION TO INCREASE BY 3-5 PERCENT TO AN ESTIMATED LEVEL IN THE RANGE OF 15.5-15.9 MMBD. WITH DOMESTIC PRODUCTION LARGELY UNCHANGED, THIS RISE IN CONSUMPTION COULD PULL OUR NET OIL IMPORTS UP TO A LEVEL IN THE RANGE OF 4.7-5.3 MMBD (EXCLUDING IMPORTS FOR THE SPR).

U.S. RELIANCE ON OPEC OIL HAS ALSO FALLEN SIGNIFICANTLY. IN THE FIRST THREE QUARTERS OF 1983, OPEC IMPORTS REPRESENTED ONLY 12 PERCENT OF U.S. OIL DEMAND. BY CONTRAST, WE DERIVED 20 PERCENT OF OUR OIL NEEDS FROM OPEC IN 1982 AND 34 PERCENT IN 1977. MEXICO HAS NOW REPLACED SAUDI ARABIA AS THE LARGEST U.S. SUPPLIER, AND NO PERSIAN GULF OIL EXPORTER WAS AMONG OUR TOP FIVE SUPPLIERS.

ANOTHER IMPORTANT MEASURE OF OUR ENERGY SECURITY IS OUR STRATEGIC PETROLEUM RESERVE, WHICH NOW CONTAINS OVER 380 MILLION BARRELS OF OIL, NEARLY 90 DAYS OF OUR ESTIMATED 1983 NET OIL IMPORTS, AND ALMOST 1000 DAYS OF OUR ESTIMATED 1983 IMPORTS FROM THE ARABIAN (PERSIAN) GULF REGION.

THE STRATEGIC RESERVE IS MORE THAN 3 1/2 TIMES THE LEVEL IN PLACE WHEN THIS ADMINISTRATION TOOK OFFICE.
U.S. PRIVATE OIL STOCKPILES ARE SIGNIFICANT RELATIVE TO U.S. OIL REQUIREMENTS. COMPARED TO CURRENT CONSUMPTION LEVELS, U.S. CRUDE OIL SUPPLIES ARE PLENTIFUL AND U.S. REFINERS HAVE AMPLE SPARE CAPACITY TO BOOST OUTPUT TO MEET SEASONAL CHANGES IN PRODUCT DEMAND.

THREAT OF DISRUPTION

THE SUPPLY AND DEMAND PICTURE I HAVE PRESENTED ATTEMPTS TO PORTRAY AN OUTLOOK FOR THIS YEAR IN A NORMAL WORLD FREE OF UNEXPECTED DEVELOPMENTS SUCH AS A MAJOR DISRUPTION OF WORLD OIL SUPPLIES. WE ARE CLOSELY FOLLOWING DEVELOPMENTS IN THE MIDDLE EAST, AND WE ARE INITIATING AN INTERAGENCY CONSULTATION PROCESS THAT WILL ENABLE US TO RESPOND IN A COORDINATED FASHION TO ANY MAJOR DISRUPTION THAT MIGHT OCCUR.

MANY DISRUPTION SCENARIOS COULD BE ENVISIONED RANGING FROM MINOR, SHORT-TERM DISRUPTIONS AT A SINGLE FACILITY TO A TOTAL CURTAILMENT OF OIL FLOWS FROM THE PERSIAN GULF REGION. WE AND OTHER AGENCIES ARE EXAMINING ON A COORDINATED BASIS THE RANGE OF PROJECTED ENERGY AND ECONOMIC CONSEQUENCES OF A CONSIDERABLE NUMBER OF THESE DISRUPTION SCENARIOS.

OBVIOUSLY, THE ESTIMATED IMPACT OF A GIVEN DISRUPTION WILL DEPEND UPON A LARGE NUMBER OF CIRCUMSTANCES AND VARIABLES, INCLUDING THE MAGNITUDE AND DURATION OF THE DISRUPTION, OFFSETTING PRODUCTION INCREASES FROM EXCESS WORLD PRODUCTION CAPACITY, GOVERNMENTS' AND PRIVATE INVENTORY RESPONSE TO THE DISRUPTION, AND NUMEROUS PSYCHOLOGICAL FACTORS INCLUDING THE PERCEPTIONS AND EXPECTATIONS OF MARKET PARTICIPANTS. THE USE OF OTHER FUELS, SUCH AS NATURAL GAS, COULD ALSO OFFSET TO SOME DEGREE THE EFFECTS OF AN OIL SUPPLY DISRUPTION.

ALTHOUGH THE DEPARTMENT OF ENERGY HAS COMPLETED A PRELIMINARY ANALYSIS OF THESE MATTERS, WE ARE IN THE MIDST OF WORKING WITH

OTHER GOVERNMENT AGENCIES TO TAKE ADVANTAGE OF THEIR RESPECTIVE DATA AND ANALYTICAL CAPABILITIES. WE ARE WORKING DILIGENTLY TO COMPLETE THIS PROCESS.

CONCLUSION

THE FUNDAMENTAL UNDERLYING WEAKNESS IN THE WORLD OIL MARKET IS LIKELY TO CONTINUE THROUGHOUT 1984 AND BEYOND. THE ACTUAL OUTCOME REMAINS SOMEWHAT UNCERTAIN AND IS DEPENDENT ON A LARGE NUMBER OF FACTORS. THE DEPARTMENT OF ENERGY IS PAYING CLOSE ATTENTION TO A NUMBER OF FACTORS WHICH MAY HAVE PARTICULAR SIGNIFICANCE AT THIS TIME, INCLUDING:

- THE PACE OF ECONOMIC RECOVERY;
- WEATHER;
- DEVELOPMENTS IN THE IRAN/IRAQ WAR;
- EXPECTATIONS OF MARKET PARTICIPANTS;
- NIGERIAN PRODUCTION POLICY UNDER THE NEW GOVERNMENT;
- INVENTORY MOVEMENTS;
- EXCHANGE RATES; AND
- PRODUCTION POLICY IN SAUDI ARABIA.

WHILE SMALL CHANGES IN ANY OF THESE ELEMENTS MAY BE SIGNIFICANT ENOUGH TO AFFECT PRICES IN THE SHORT RUN, UNDERLYING OIL DEMAND AND SUPPLY TRENDS ULTIMATELY WILL DETERMINE THE LONG TERM OUTCOME.

THANK YOU VERY MUCH.

WORLD OIL OUTLOOK
(Million Barrels Per Day)

	1983	1984
Consumption		
United States	15.1	15.5 - 15.9
U.S. Territories	0.3	0.3 - 0.4
Western Europe	11.9	11.5 - 12.1
Japan	4.4	4.3 - 4.4
Other OECD	2.2	2.1 - 2.3
Total OECD	33.8	34.0 - 34.9
Other Market Economies	11.2	11.1 - 11.5
Total Consumption	45.0	45.1 - 46.4
Supply[a]		
United States	10.7	10.7 - 10.8
Canada	1.7	1.6 - 1.7
North Sea	3.1	3.2 - 3.4
Other Developed Countries	1.2	1.2 - 1.3
Mexico	3.0	3.0 - 3.2
Other Non-OPEC	4.4	4.5 - 4.6
OPEC	18.4	19.0 - 20.0
Net CPE Exports	1.8	1.5 - 1.8
Total Supply	44.3	45.0 - 46.5
Stocks Change	(0.7)	(0.2)- 0.2

a. Includes production of crude oil and natural gas liquids, refinery gains, production of alcohol and other liquid hydrocarbons from other sources of energy, and net exports of oil from Communist countries.

UNITED STATES OIL OUTLOOK
(Million Barrels per Day)

	1983	1984
Consumption	15.1	15.5-15.9
Production	10.7	10.7-10.8
Net Imports:		
Excluding SPR	4.0	4.7- 5.3
SPR Fill Rate	0.2	0.2
Total Net Imports	4.2	4.9- 5.5
Stock Change:		
Commercial	(0.2)	(0.1)-0.1
SPR	0.2	0.2
Total Stock Change	0.0	0.1- 0.3
Unaccounted For	0.2	-

The CHAIRMAN. Thank you very much, Mr. Secretary. We'll try to limit ourselves on the first round of questions to 10 minutes. I think that given the number of members that we have here that we'll spread the time available.

Mr. Secretary, you, of course, have concluded your statement by saying what may happen in the Middle East is virtually impossible to predict and yet we must attempt to make some policy based upon what might or is probable or likely to happen. And there are various ways in which you can mathematically or otherwise assign probability.

In view of the past history of 13 oil supply interruptions in the last 30 years, three in the last 10 years, and the current situation as we see it in the Middle East today, do you have any assessment of the probability of events causing some supply interruption from the Middle East?

Secretary HODEL. Mr. Chairman, I cannot give you a mathematical or numerical quantification. I can give you an opinion which is based on a composite of my own experiences and what I hear from the staff. If I had to bet, I would bet that there will be some kind of disruption of supply or a perceived disruption of supply out of that area some time in the course of this year. I say perceived because it's possible that an event can occur such as occurred just a month or two ago when a tanker was alleged to have been sunk. As a result of that sinking there was difficulty on the part of some shipping owners getting crews, and captains of ships to enter the gulf until it was clarified as to whether there had been a sinking or whether it would be hazardous or whether there would be protection, so even the perception of an event may cause a temporary interruption.

The CHAIRMAN. Well I've made the statement repeatedly over the years that you don't have to be a genius to make the kind of a bet that says I'll guarantee with 100 percent certainty that there will be an interruption in the next 10-year period. I don't know when it will occur, or how it will occur, or where it will occur, but I know that it will occur. I can't go to a mathematical formula and prove, it but my reason tells me that's true based upon past history and upon current events. So some of our planning must be on the basis of the knowledge that there will be an interruption of some kind without knowing exactly what it may be. We may differ from our assessments of what was the reason things happened. Senator Metzenbaum said in effect that the oil companies created all the price rise as speculation or took advantage of the situation, but spot markets are not controlled by oil companies, they're controlled by a whole lot of different people and spot markets change based upon perceptions and expectations. The oil supply interruption in 1979 was less than 10 percent of the free world's oil supply and yet prices doubled during that period of time.

So marginal shifts in supply leverage into major price changes. Is that a phenomenon of the past, or is that something that we have to anticipate might occur in the future?

Secretary HODEL. I think that you have a sensitive market which is affected, Mr. Chairman, not only by the actual supply but by belief about supply and therefore a modest interruption can have a dramatic price effect over a short time period. My understanding is, and it's a fairly good agreement among some analysts at least, that the last time we had a price rise, had we been able to resist having the Federal Government get involved in allocation and price control activities, we would not have had as extended or severe problems of shortage and price we did. Obviously it's a point over which people can argue and differ but I think there's a case that can be made for that.

Your point is well taken. I know of your great interest and concern in this. You've raised this issue with me at my confirmation hearing and ever since then. I appreciate it. We have been taking efforts, as you know, to improve our preparedness for a range of different kinds of reactions, believing that if we can responsibly comment and respond to an event we can minimize the panic response and the hoarding response which has an effect on price and supply.

The CHAIRMAN. Well, Mr. Secretary, I understand that there are a lot of opinions that have been expressed, some of which I share, that indeed governmental intervention caused the supply disruption to be worse and therefore the price responses to be worse. But barring all-out nuclear attack on this country I suspect Congress will be in session again during the next interruption and If Congress is the cause of that Government intervention, Congress will be the cause of that Government intervention again. So that isn't something that we just say is an aberration of the past which we're not going to repeat. It is an aberration that will be repeated in the future. Congress acts on its own determination of what is responsible, and those are unpredictable patterns.

As I've said many many times before, when the phone is ringing off the hook and some farmer out there says: "Senator, I don't have enough diesel to keep that tractor running, you've got to do something"; and sure enough, the Senator is going to do something. It may not always be constructive, but he's going to try. The same thing is true of the fisherman, whether it be in New England or Alaska, who doesn't have enough diesel to get his ship out of the port. When he says I'm out of diesel, I've got to have some fuel, the Congressman will try to get him some. So there will be Government intervention at some point. That in my judgement is the most likely scenario of repetition of the past.

Now the question does not become whether or not there will be Government intervention, it becomes how do we plan for it and what kind. In a perfect world in abstract theory we might hypothesize something else, but this is my 18th year in the Congress of the United States and I think I know a little bit about the tenor of this body. I have an absolutely confident prediction that Congress is not going to sit on its hands while people are getting cold, and while industries are closing, and while trucks cannot get diesel at truck stops. So there needs to be Government policy. We have discussed this many many times in the past, and we're working now on the kinds of emergency response mechanisms and tools that we would have in agreement with the administration with respect to at least a framework upon which there is common agreement between yourself and myself and I would hope that legislation would be passed and we can at least put that much in place.

I don't know whether you are prepared at this time or not, but I note on page 13 of your statement that you have stated you have a preliminary analysis of the supply interruption questions. Is that in shape that you could provide such an analysis on the result of that work to date to the committee?

[The information follows:]

The Department is now evaluating the potential impacts of a variety of Persian Gulf supply interruption scenarios. The Department is examining the flow of oil through the critical Strait of Hormuz and from critical facilities in the Gulf, such as Kharq Island. These analyses have estimated economic impacts (e.g., price increases and GNP, inflation and unemployment effects) for the U.S. and its allies for scenarios ranging from a partial to a total loss of supplies from the Persian Gulf. Various supply losses have been analyzed on the basis of duration (i.e., 6 months and 12 months.) Postulated U.S. and allied responses also ranged from limited to significant, particularly with respect to the use of Government held or controlled petroleum stocks.

Results of the analyses indicate that limited disruptions of short duration have comparatively minor economic impacts and are not significantly affected by U.S. and allied Government-controlled stock policies. However, as the length and severity of the hypothetical disruption increased and world oil prices doubled or tripled, the estimated economic impacts became significant for the U.S. U.S. policies regarding use of Government reserves, particularly when accompanied by similar policies in other OECD countries, to a certain extent, mitigate adverse impacts—in the best case, by a factor of one-third. Because of their relatively higher dependence on imported oil, projected impacts on Western European countries were more pronounced than for the U.S. In addition, due to Japan's extreme dependence on imported oil, projected impacts were nearly twice as much as those projected for the U.S.

Secretary HODEL. Mr. Chairman, I don't believe I have a copy of that with me but I would be happy to supply the committee with a list of the kinds of things they are looking at. As I know you well know, and in spite of the implications of comments that some people make with regard to our preparedness effort, we not only have agreed with you about the framework agreement but we also have supported extension of 252 and we have engaged actively since last summer, since the first word of the possible Iraq utilization of exocet missiles in an increasingly aggressive effort, to prepare not only the Department of Energy but the Government-wide agencies to be able to respond in meaningful terms when something happens.

As you know, we have substantial emergency standby authorities if the situation deteriorates to a given level. It is between the commencement or the perception of an interruption and the time when we have a major problem on our hands that we are basically talking about. And our belief is that all of the systems that are available to us in the way of Government intervention, allocation, or price controls, are less satisfactory than the alternative of permitting the market to operate.

Now the strategic petroleum reserve is a clear exception to that. And as I've testified before and stated many times publicly, in the tests that we ran last summer we clearly indicated that at the very earliest announcement of any significant direction in that case—we would go for an early and immediate drawdown at the maximum rate possible on the 30 day basis from the strategic petroleum reserve in order to buy time and see what the rest of the impacts would be. It's one of the issues we will not know the day of the interruption how long will this last, how severe it is and how deep it will really be. I think we're in a position, thanks to the strategic reserve and reduced consumption in this country, to respond in a rational and responsible way without the Government having to step in immediately and start telling people what they can buy, where they can buy it and what the price is they would have to pay for it.

The CHAIRMAN. Mr. Secretary, on page 3 of your statement you've analyzed consumption trends and you point out various components of reasons why consumption in the United States has declined. Is it possible to allocate among those causes the proportion or degree with which each of those causes contributed to the decline in consumption such as how much of it was due to the recession? How much of it was because of price induced conservation? How much because of other conservation activities? How much of it is weather related?

Secretary HODEL. Mr. Chairman, the best information I have in mind, but probably not the best information the Department has which I would like to supply if I could for the record, is that we think that approximately one-third of the reduction was price induced; one-third of it was economically related; and one-third of it was what I call structural changes where actually better insulation, weatherization, more efficient automobiles and other vehicles, more efficient engines, and factors of the like. I would like to refine those figures if I may and if I'm several percentages off on that rough calculation I hope you'll forgive me.

The CHAIRMAN. And I hope if you are you will provide it for the record.

Secretary HODEL. I will provide it for the record in any event, especially if it's accurate.

[The information follows:]

Between 1978 and 1983, U.S. oil consumption fell from 18.8 million barrels per day to 15.1 million barrels per day, a decline of 3.7 million barrels per day, or about 20 percent. The Energy Information Administration (EIA) has estimated how much each of the following key factors, taken alone, contributed to the change:

Factor and Contribution:
Energy Prices—2.4 million barrels per day decrease
Economic Growth—1.5 million barrels per day increase
Nonprice conservation, efficiency, weather—2.8 million barrels per day decrease

These figures are rough estimates only, particularly as they encompass a period of time with significant price changes and other structural changes. However, it is clear that the increase in energy prices and energy conservation measures acted to decrease demand sharply, which was somewhat offset by economic growth over some of this period.

The CHAIRMAN. Senator Metzenbaum.

Senator METZENBAUM. Mr. Hodel, your statement, and I stepped out for a second, was if I were to bet I would bet there would be some kind of interruption of supply some time this year. Have I heard it correctly?

Secretary HODEL. I believe that's accurate, yes.

Senator METZENBAUM. That's enough in my opinion to cause the price in the spot market to go up $2 today, because that's a pretty drastic, draconian kind of conclusion that you reached. I'm not challenging that at all, but put that together. Then with your response to the chairman that if such an eventuality would occur you would supply the committee with the kinds of things we're looking at. I for one am scared, because if you are so certain that in the next 365 days there will be an interruption which could be today, tomorrow or any other day, and all that you can respond to the chairman about is we'll tell you what we are looking at. We will also make available some oil from SPR. Frankly, that to me is very frightening, and I'm asking you what else would you do specifically besides release some oil from SPR?

Secretary HODEL. I think I have to begin with the clarification of the answer that I gave, because what I was answering was what did I think the chances were of some kind of interruption, and I said if I had to talk about some kind of interruption I would have to bet some time in the next year some kind of interruption would occur. Those interruptions could be anything from a one day blockage at a single port to sinking of a single tanker. With several days interruption, as I indicated in my opening statement, you could have a significant amount of the production capacity in the gulf wiped out. Because of the surplus production capacity of oil both in the gulf and in the rest of the world, provided the gulf remained open and that wasn't subsequently damaged or cut off, you would still have surplus production capacity. So I think as long as the interruption we're talking about is below the easily obtainable increased production capacity, the impacts are not drastic and you cannot be certain that the price will rise in any dramatic fashion. Only begin to talk about those things when you talk about long term, severe disruptions of large magnitudes. The chances of those are far slimmer. In fact as I indicated in my opening statement I think the chances of an interruption of supply from the gulf being on an extended basis is really quite slight at this point, and I think that's recognized in the gulf area. I think our European allies and Japan recognize it.

Senator METZENBAUM. Do you agree with the other testimony that Mr. Cordesman has submitted to us and will testify to shortly which indicates an interruption in the Mid East for a few months will increase prices to $40 to $45 per barrel, an increase of 50 percent?

Now you don't seem to be as concerned about marketing, price impact, as some of us do, but the question I have is do you agree with that analysis of Mr. Cordesman?

Secretary HODEL. First of all I have not seen his analysis so it is not appropriate for me to comment on it. But let me say, it's easy to devise interruption scenarios that are large enough that you will have an impact on the price of oil so that it will rise dramatically. The fact is that by legislation and allocation and price controls in the Department of Energy, we cannot stem the tide of a world oil market if there is a drastic supply shortage. The price must rise or we continue to subsidize excess consumption. And the point that Senator Evans made earlier is we need to be concerned about how we turn away from that. We need to be doing that now in planning, but we also need to recognize that the most counterproductive thing the United States can do in the event of oil supply interruption is artificially sell oil to the American people at a price that doesn't represent the world oil market because either of two things can happen. Either we have a drastic shortage because we can't gain it for our people because others will be paying the world oil price, or we encourage them to consume at higher levels than can be supported for any period of time and this is why the strategy the Government develops has to be extremely sensitive to that.

Senator METZENBAUM. If there is a 7-percent shortage then we have to give up our oil to the other nations. And what happens if there's a 5-percent shortage or a 6-percent shortage? And what happens also to domestic prices if we have to give up that 7 percent?

Secretary HODEL. Senator, I can't play through for you all of the consequences of an IEA trigger activity. Seven percent trigger and 12 percent trigger or any IEA agreements. I'm not sure whether they've even been utilized other than in tests. If we reach the point where we are facing an extended 12 percent shortage and the United States and others are called upon to utilize their reserves, interchange some portion of their reserves, obviously you've reached a very drastic situation and it will have an impact on price, and the duration of it will be extremely important. Not only the actual duration but the anticipated duration.

Senator METZENBAUM. As you know, Senator McClure and I came to an agreement with respect to the antitrust exemption and the extension as pertains to the IEA. You oppose that amendment as I understand it. You sent a cable to the chairman at the time, is that correct?

Secretary HODEL. That is correct.

Senator METZENBAUM. Is that a matter of public record, that cable?

Secretary HODEL. I don't know.

Senator METZENBAUM. Could we have it so it might be a matter put in the record?

Secretary HODEL. I have no objection.

The CHAIRMAN. Without objection, it will be made part of the record.[1]

Senator METZENBAUM. Why do you oppose that amendment? It would have provided for the antitrust exemption to be extended and it would have provided within a period of time that there be a requirement to move forward with a mandatory allocation in the program. But if they're not, the very worst that would happen is no worse than it is at the moment, that the antitrust exemption would expire.

Secretary HODEL. Senator, the issue was raised to me at a time when I was in the Middle East. The issue as I recall it, I have not reviewed the cable, nor have I reviewed the proposed legislation, but the issue as I recall it was section 252 which provides the antitrust exemption be extended, and that it would be done so with an addition that unless within 6 months we reach some kind of accommodation on standby price and allocation control authority, the exemption would then terminate. If I recall that correctly, my conclusion was that we by so doing, by agreeing to that kind of an extension, would be acknowledging that we thought some kind of price and allocation control authority could be devised which would be satisfactory to us. And I, as yet I have not see standby price and allocation authority which you can confirm in the administration that doesn't look a little bit like trying to take away just a little bit of freedom of the press or free speech. I think once you open that door you drag the Government into a very aggressive and active participation in the market which has clearly not worked in the past.

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[1] The cable regarding the antitrust exemption and the extension as pertains to the IEA has been forwarded under separate cover. It is a classified document and will be retained with the classified portion of the hearing record.

Senator **Metzenbaum**. I'm not going to get into the issue of freedom of the press and free speech because I take issue with you on that. But it's not worth quibbling about at this moment because that's not the issue.

Secretary **Hodel**. The principle is the same.

Senator **Metzenbaum**. My question to you, and you didn't answer when I asked you before but I'll ask you again, this afternoon something happens in the Middle East. What are you going to do?

Secretary **Hodel**. What happened?

Senator **Metzenbaum**. It's a major matter and you can't even evaluate it but you know this, we don't know whether it will mean 1 percent, 5 percent, or 20 percent of our supplies, of the supply coming out of the Middle East is going to be cut off. We don't know how soon the plant can be put back in operation or the means of transportation can be put into operation, but the fact is that triggering immediately has an impact upon the market price. That rapid rise in the market price affects jobs in this country, affects inflation in this country. What are you going to do about it?

Secretary **Hodel**. Senator, you are leaping to conclusions about what happens in such an event based upon a picture apparently in your mind of what kind of an event has taken place. That's why I asked what happened. You said what am I going to do? What I do, what is done by the administration, what is done by Congress is going to depend very definitely on what in fact happens. Not only what happens, but what we think its duration is going to be.

Senator **Metzenbaum**. Give me some reassurance you're going to do something. Tell me what you're going to do. You're under your own opinion.

Secretary **Hodel**. We have a process in place and the process we have now established not only within the Department, but in the administration, a series of working groups which are identifying currently not only what the issues are but are also establishing the lines of communication which we need to have so that the administration speaks with a common voice on this issue. The first issue you have to face in the event of a disruption is not to panic and assume that the price is going to go through the skylight. First you need to determine Senator, what happened as best as you know, and in fact you know and I know the first message out on an interruption is garbled. There are press reports, sometimes very accurate, sometimes distorted, because the people who are talking don't all have the same facts. So the first thing we need to do is determine what happened.

Next, how large and how severe is that at this moment? Next, how long is it likely to last? And before you can make that determination you have to take a look at what some of the options are. The options on that are a wide range. We have the strategic reserve. We have excess production capacity, depending on what kind of interruption has occurred. Excess production capacity may provide a total answer. And let me say with some confidence that if the interruption is 1 million or 2 million barrels a day, with the excess production capacity that exists today, I would be surprised if you saw any significant rise in price for any period of time because speculators would be crazy to invest in oil or hold it thinking they're going to get a price rise when the excess production capacity is as great as it is.

So it seems to me the first thing we will do is evaluate and determine its magnitude. If we believe there's been a direct interruption of supply, I believe that we will be recommending to the President the actions necessary to make an early disposition of oil from the strategic petroleum reserve. That's step one.

Clear and open communication regarding those analyses and that decision, I think, will have a distinctly beneficial effect on the question of panic and the question of price. You and I know that if every automobile owner in American went to the service station today we would have spot shortages simply because there aren't enough gallons of gasoline in the tanks under the ground of service stations to fill all the unused capacity in the gas tanks. Yet it works very well as long as we fill the ordinary cycle. So we need to work hard to offset the panic and I think that's what we would do. I don't think you can say that this panic will take hold and be at the magnitude you've indicated and prices will take off until and unless you structure a full blown scenario.

Senator METZENBAUM. Mr. Chairman, my time is up but I must say that I have great respect for the Secretary, but I'm disappointed by the response. I don't think you have an answer and that concerns me much.

The CHAIRMAN. Senator Evans.

Senator EVANS. Mr. Secretary, as I said earlier, I wanted to proceed on a somewhat different line. Let me begin by suggesting that I guess as we all know, any nonrenewable resource will someday run out. Our only question in front of us is when. And it seems to me that in all of this price and supply debate, there always is and I guess must be an empty seat at the bargaining table for future generations, and if they were there and if they were bargaining, would certainly drive the current price of oil up and up substantially. In their view it would be a valuable commodity. They would be able to preserve some of it for their generation and that would certainly put the squeeze on current generations. I guess no one has figured out how to fill that empty seat, but it does put an emphasis on being as efficient at least in the use of current energy as we can afford to be.

I would like to know what we are continuing to do about it. Frankly, I'm concerned as I see the current shift in advertising and on new automobiles, the emphasis instead of on fuel efficiency and the number of miles per gallon, is on the cubic engines of the engine and how fast you can get from zero to 60. We're back to the advertising in the 1950's in terms of automobiles.

Do you have available and can we get some sense of the effect on oil supply or oil consumption of for instance a 1-mile-per-gallon average increase in the efficiency of automobile use based on the average daily number of miles driven? The same thing with an average change, I don't even know how you would measure it in terms of heating, but I suppose one would be the change in consumption based on one heating degree change.

Do you have that sort of thing available, and if so can you get it?

Secretary **Hodel**. Senator, I'm sure that we can produce and develop such numbers reasonably quickly for you and I'd be happy to supply some that would be responsive.

As I understand your question, what kind of a consumption difference would it make if we could even make a 1-mile-per-gallon change in automobile or other transportation, what kind of saving is possible, or potential from adjustments in consumption patterns in buildings and homes and industry. I know we have numbers that provide ranges of expectations. These are always somewhat problematical as I know you know from your experience, but certainly I'd be happy to supply those.

[The information follows:]

If all highway vehicles could achieve an immediate one-mile-per-gallon improvement, the petroleum savings would be 0.5 million barrels of oil per day, or more than one quad of petroleum. Using the rule of thumb that lowering the thermostat one degree F° in residences would reduce energy consumption by three percent, a one degree reduction would have saved .16 quads in 1982. For commercial buildings, the rule of thumb is 2.6 percent savings for a one degree F° reduction in thermostat setting, and would have saved .12 quads of energy in 1982. With similar weather, the saving in 1984 or 1985 would be nearly the same. In industry, most energy is consumed by industrial processes. The amount of energy used for space heating is small. The incremental amount of savings resulting from a one degree change in thermostat setting in this sector is estimated to be quite small, probably less than 0.01 quad.

Senator **Evans**. I would like it on the basis of some unitary figures. That probably can be done somewhat more accurately and we would know more accurately what 1-mile-per-gallon change on the current inventory and use of automobiles would be, I would think fairly accurately. The same on whatever unitary measure you can use on heating or industrial commercial use.

One of the major concerns I have is the change, the potential change in the relative prices of fuels. Have you done any work or do you anticipate what will happen as we begin to fold in, as I'm sure we must, the added environmental costs that are not now being calculated or folded into price? Those major ones we're facing currently of course would be acid rain for instance; some of the other environmental costs which seem to be more clearly associated with burning fossil fuels, are not directly associated with price of those yet. Have you done any work that would indicate what might happen in terms of pricing of those fuels and particularly what might happen in the relative prices of those fuels versus others that may not have the same environmental cost?

Secretary **Hodel**. Senator, I think you'll find that our Energy Information Administration as well as our Office of Policy have taken a look at components of that. Whether it's a comprehensive study I don't know, but I think there are several issues here which interact.

One is that you have the price as it is applied directly to coal. As coal pricing increases it has a direct effect upon attitudes and consumption of natural gas, oil, other sources of electricity. We have certainly seen this with regard to the price increases brought on by some of the costs in nuclear, as it's raised electrical prices and made alternative fuels look more desirable including in the Northwest the burning of wood which is having its own environmental impact in some areas. And what we found very clearly is the drop in the price of oil which resulted this last year in residual prices dropping, brought about parts of this country where natural gas was being priced out of the market by residual fuels being available at a lower price than the cost per Btu for natural gas. So these fuels do in fact compete with each other, and I think we will try to provide you with some information that will be of interest in this area. But I think the bottom line will show that all of these fuels compete at least at the margins and are price sensitive.

[The information follows:]

The Energy Information Administration has prepared an analysis titled Impacts of the Proposed Clean Air Act Amendments of 1982 on the Coal and Electric Utility Industries, DOE/EIA-0407 (Washington, D.C., June 1983). This report provides projected impacts on 1995 prices of electricity, regional coal production, and capital expenditures. In this study, utilities are assumed to have 3 options in order to comply with the legislation. The options include retrofitting facilities with flue gas desulfurization equipment, switching to lower sulfur coal or using coal-fired plants less. Based on the least cost strategy at a regional level and an examination of individual boiler capabilities, the study projects that 1995 electricity prices would rise by as much as 4.3 mills per kilowatthour (1982 dollars) as a result of the proposed legislation. The real price of electricity in 1995 would likely increase from 5.2 to 6.4 percent as a result of higher coal costs and additional capital expenditures. This price hike corresponds to a $6.8 billion to $11.1 billion (1982 dollars) increase in the 1995 revenue requirements for electric utilities. Large shifts in regional coal production and increased capital expenditures are projected. The Executive Summary for the study is attached.

February 08, 1984

DOE/EIA-0407

Impacts of the Proposed Clean Air Act Amendments of 1982 on the Coal and Electric Utility Industries

Energy Information Administration
Washington, D.C.

June 1983

EXECUTIVE SUMMARY

Senate bill S.3041, the "Clean Air Act Amendments of 1982," addresses the problem of acid deposition (acid rain) in the eastern United States. This legislation proposed reducing the sulfur dioxide (SO_2) emissions and limiting the nitrogen oxide (NO_x) emissions in a region that includes the 26 States east of the Mississippi River, and 5 States adjacent and to the west of the Mississippi, plus the District of Columbia, subsequently referred to as the 31 States. Under the proposal, by 1995 this region must lower annual SO_2 emissions to 8 million tons less than actual emissions in 1980, a reduction of approximately 50 percent of electric utility emissions in 1980. Increases in SO_2 emissions after January 1, 1981 must be offset by reductions from other sources.

Acid rain refers to the wet and dry deposition of acids--chiefly sulfuric and nitric acids--from the atmosphere to the earth's surface. Acid rain occurs after SO_2 and NO_x emissions combine in the atmosphere with other materials, in a chemical reaction. Thus the emission of SO_2 and NO_x is a precursory condition to the formation of acid rain. SO_2 and NO_x emissions into the atmosphere come from both natural and man-made sources.

This study determines the lowest cost means by which electric utilities can reduce their 1995 SO_2 emissions to comply with the legislation. Fundamental scientific and economic uncertainties surround the potential environmental benefits that would result from this level of reduction in SO_2 emissions. Therefore, a cost-benefit analysis of the proposed legislation is not currently possible.

This report is to help legislators, policymakers, and industry analysts to assess the costs of Senate bill S.3041--as well as costs of future similar legislation that may be proposed--to the electric utility industry and its consumers, and to assess its impact on the coal industry. Senate bill S.3041 did not pass the 97th Congress, but similar bills have been introduced in the 98th Congress, such as S.768. This report is unique in two respects:

- Every utility coal-fired boiler and electrostatic precipitator in the 31 States specified in the proposed amendment was examined to determine how the utility could reduce its SO_2 emissions. Limitations on the utility's options were taken into account, so that utilities' responses to the proposed amendment could be analyzed.
- Demand levels for electricity and transportation rates for shipping coal were varied in order to determine how such variations of these two important parameters would affect the projected results.

"Base case" in this study is actually a pair of base cases, both of which are examined for their effects on scenarios relating to the electric utility industry and to coal production. In one base case, S.3041 is assumed to be in effect; in the other base case, it is not.

Both base cases rest on the same two assumptions. The first assumption, drawn from the mid-case projections of EIA's 1981 Annual Report to Congress, is that the average annual growth in demand for electricity is 2.9 percent from 1980 through 1995. The second assumption, also based on EIA projections, is that transportation rates for coal will rise at a real average annual rate of 3 percent from 1983 through 1995.

It is assumed that decisions are made over a sufficiently long lead time to permit market structures to adjust in an orderly manner. For example, railroad facilities are assumed to be available when required, new western coal mines opened as needed, and long-term coal contracts (such as existing contracts with coal mines located near power plants) renegotiated when necessary. Mine-mouth power plants using high-sulfur coal are assumed to be able to switch to lower sulfur coal by 1995; however, captive coal mines associated with mine-mouth power plants in Ohio and Pennsylvania are projected to continue burning medium- and high-sulfur coal. These States include more than 82 percent of the total captive mine capacity included in this legislation.

The sensitivity cases examined the range of possible outcomes due to changes in two key assumptions. The growth in demand for electricity is varied to a high of 3.9 percent, and to a low of 1.9 percent. Growth in demand for electricity is studied because it affects the ability of a utility to retire plants that burn high-sulfur coal, or to use them less. It also affects the increase in SO_2 emissions from new sources that must be offset by existing plants.

Two variations of transportation rates are studied because of uncertainty about the additional increases required to obtain revenue adequacy for the railroads. Revenue adequacy refers to the ability of a railroad to earn enough profit to attract new capital. In one variation, the transportation rates increase 5 percent over the base case, compounded annually, and in the other, 9 percent compounded annually. Future rail rates for transporting coal affect demand for low-sulfur coal mined in the West.

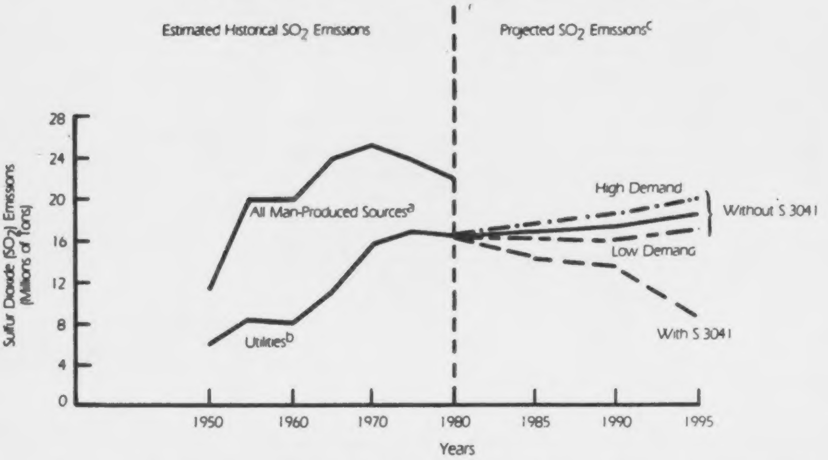
The report projects the amount of emissions from electric utility power plants that would occur by 1995 under the current limitations of the Clean Air Act. It also analyzes the effects of the proposed legislation on the electric utility industry, including the capital expenditures required to reduce SO_2 emissions, and the resulting effects on the cost of electricity. The initial 8-million-ton reduction in SO_2 emissions is assumed to be accomplished solely by electric utilities; industrial emission reductions are not considered. Similarly, only increases in SO_2 emissions from power plants are assumed to be offset by reductions within the utility industry; increases and offsets of industrial emissions are not addressed. Effects on the coal industry are also examined. The report concludes with a general discussion, based on current literature, of the potential benefits to be gained from reductions in SO_2 emissions. The benefits from the proposed legislation of an 8-million-ton reduction in SO_2 emissions and the value of such benefits are not specifically addressed.

The results developed in this study assume an economic response by electric utilities in meeting the requirements of the legislation. The analysis uses a modeling framework that minimizes the marginal cost of producing electricity on a regional basis, subject to the constraints of lower SO_2 emissions. Although uncertainties regarding some assumptions in this study have been analyzed, there are technical (e.g., railroad congestion), financial (e.g., cost of capital), and political (e.g., new legislation) considerations not addressed here. These considerations could lead to lower cost impacts or, more likely, higher costs than those reported. For example, if new legislation restricted utilities to the use of high-sulfur coal, then more retrofits with scrubbers would be required and costs would be higher.

Projections

Without the enactment of S.3041, SO_2 emissions from power plants are projected to increase for the 31 States from 16.1 million tons in 1980 to 18.1 million tons in 1995 (see Figure ES1). During the same period, NO_x emissions are projected to

Figure ES1. Electric Utility SO_2 Emissions in 31 States



[a] United States-Canada Memorandum of Intent on Transboundary Air Pollution, "Emissions, Costs and Engineering Assessment," United States/Canada Work Group on Emissions, Costs and Engineering Assessment, Work Group 3B, Final Report, June 1982, Table B 1 3, pp 36-37

[b] Pacific Environmental Services, Inc., Durham, N.C., estimated from electric utilities reports filed with the Energy Information Administration and the Federal Power Commission

[c] Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, National Coal Model (NCM), 1983

increase from 4.8 million tons to 6.3 million tons. This increase will occur because new sources of emissions will be added more rapidly than old power plants are retired. The emission levels increase through 1995 even though the new coal-fired units produce much lower emissions as they generate electricity. Emissions from existing coal-fired units will decline continually as these units retire. The proposed legislation would accelerate this decline by requiring these units to reduce the 1980 SO_2 emissions level by 8 million tons in 1995 and to offset new emission sources. When these existing units are all retired, 30 to 50 years after 1995, emission levels will be approximately the same with this legislation or without it. A limitation of this study is the absence of quantitative results for the post-1995 period.

Electric utilities can reduce their SO_2 emissions from existing power plants by (1) retiring older units and/or reducing their use, (2) burning lower-sulfur coal, and (3) retrofitting existing power plants with flue gas desulfurization (FGD) systems. Each option has its own costs.

The impacts of S.3041 in the 31 States are summarized in Table ES1 for 1995. This table displays the projected values for each case with S.3041 minus those projected without S.3041 in order to determine the impacts of the proposed legislation. The increase projected in cumulative capital expenditures by 1995 is comprised of the costs to retrofit units with FGD systems, to modify some boilers or electrostatic

Table ES1. Differences in Expenditures and Capacity Modifications Projected with S.3041, Minus Those Projected Without S.3041, for the Base and Sensitivity Assumptions in 31 States, 1995

		Transportation Cost		Electricity Demand	
Impact of Legislation	Base[a]	5%[b]	9%[c]	Low[d]	High[e]
Financial					
Incremental Cumulative Capital Expenditures					
(Billion 1980 Dollars)	8.6	10.1	11.1	7.2	17.8
(Billion 1982 Dollars)	10.0	11.7	12.9	8.4	20.6
Incremental 1995 Annual Costs: Fuel, O&M					
(Billion 1980 Dollars)	2.6	4.1	4.6	0.6	6.7
(Billion 1982 Dollars)	3.0	4.8	5.3	0.7	7.8
Increase in 1995 Electricity Prices					
(1980 Mills per Kilowatthour)	2.7	3.0	3.0	0.9	3.7
(1982 Mills per Kilowatthour)	3.1	3.5	3.5	1.0	4.3
Incremental 1995 Revenue Requirements					
(Billion 1980 Dollars)	5.9	6.7	6.7	1.7	9.6
(Billion 1982 Dollars)	6.8	7.8	7.8	2.0	11.1
Operational					
Capacity Retrofitted with FGD					
(Gigawatts)	21.8	34.8	42.4	10.7	42.9
Capacity Converting to Low-Sulfur Coal					
(Gigawatts)	99.1	71.4	65.8	75.2	95.6

[a] The base case has a 2.9 percent average annual rate of growth in demand for electricity and approximately 3 percent average annual real increase in rail transportation costs. This column contains the difference in the base case with S.3041 minus the base case without S.3041.

[b] The 5-percent increase (compounded annually) in transportation costs is in addition to the 3 percent real increase in the base case. This column contains the difference in the 5-percent case with S.3041 minus the 5-percent case without S.3041.

[c] The 9-percent increase (compounded annually) in transportation costs is in addition to the base case transportation rate. This column contains the difference in the 9-percent case with S.3041 minus the 9-percent case without S.3041.

[d] Low demand is a 1-percent decrease (1.9 percent average annual growth rate from 1980 to 1995) in electricity demand growth. This column contains the difference in the low demand case with S.3041 minus the low demand case without S.3041.

[e] High demand is a 1-percent increase (3.9 percent average annual growth rate from 1980 to 1995) in electricity demand growth. This column contains the difference in the high demand case with S.3041 minus the high demand case without S.3041.

precipitators to burn low-sulfur coal, and to build additional power plants or transmission lines in order to retire older units or reduce their use. In the base case with S.3041, capital costs increase by $8.6 billion (1980 dollars). Of this total, FGD costs in 1995 are projected to be $2.8 billion (1980 dollars) higher than in the base case without the legislation; the cost to modify boilers or electrostatic precipitators is projected to increase by $2.1 billion (1980 dollars); and expenditures for new plants and transmission lines are projected to increase by $3.7 billion more than without S.3041 (1980 dollars).

In addition to increased capital expenditures, there would also be increases in the operation and maintenance expenses and fuel expenses for electric utilities in 1995. The expenditures for operation and maintenance are expected to increase by $335 million and for fuel by $2.3 billion (1980 dollars) if such legislation is implemented.

Increases in the price of electricity to consumers caused by the required reductions in SO_2 emissions are also projected. The price increases begin primarily after 1990 as significant capital expenditures are made, and in 1995 they are projected to be 2.7 mills per kilowatthour (1980 dollars) higher in real terms in the base case with S.3041 than without S.3041. This price increase is the result of an additional revenue requirement of $5.9 billion (1980 dollars; $6.8 billion in 1982 dollars) in 1995. This analysis assumes a time-phased plan for compliance with the legislation. The 1995 annual revenue requirement could be as high as $9.6 billion (1980 dollars; $11.1 billion in 1982 dollars), as shown in Table ES1. The results of this analysis fall within the range of those reported by other investigators. A detailed comparison with other studies is included in Chapter 7.

Findings

The changes proposed by the Clean Air Act Amendments of 1982 would result in a reduction of over 50 percent in the amount of SO_2 projected to be emitted by electric utilities in the 31 States in 1995. This represents only a 20-percent reduction in the 1980 natural and man-produced SO_2 and NO_x emissions, which are precursors of acid rain.[1]

Major findings of this report assessing the impacts of the proposed legislation using a least-cost approach are summarized below:

- Switching to low-sulfur coal is projected to be the preferred choice of electric utilities to reduce SO_2 emissions. Capital expenditures are not required for 60 percent of the boilers that convert to low-sulfur coal. However, if transportation rates for shipping coal increase substantially, utilities in the Midwest would likely continue using high-sulfur coal produced in their own or nearby States, and would retrofit more power plants with an FGD system.

- Cumulative capital expenditures in the 31 States affected by the proposed legislation are projected to increase by $7.2 billion to $17.8 billion, in 1980 dollars, for the range of scenarios considered. Most of this increase occurs from 1991 through 1995 and represents 4.4 to 9.6 percent of projected total capital expenditures by all utilities in the 31 States for that period.

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[1] Appendix B. Also, Jennifer A. Logan, "Nitrogen Oxides in the Troposphere: Global and Regional Budgets," Center for Earth and Planetary Physics (Harvard University, December 1982), Table 10. (Submitted for publication to Journal of Geophysical Research.)

- Average electricity prices are projected to increase by 0.9 to 3.7 mills per kilowatthour across the various scenarios in 1995, as utilities must recover higher capital expenditures, fuel expenditures, and operating and maintenance costs. The 1982 average retail electricity price for privately owned utilities was 52.8 mills per kilowatthour in 1980 dollars.[2]

- The coal industry is likely to experience large shifts in the amount of coal produced in the different regions. In the Midwest, coal production is projected to drop below its 1980 level, and in Northern Appalachia and the Central West coal production is projected to grow at a slower rate than currently expected. Central Appalachia and the Western Northern Great Plains are projected to increase their production since the legislation benefits the producers of low-sulfur coal. The large shifts in regional coal production indicated in this study are likely to result in (1) a major redistribution in the employment of coal miners, and (2) shifts in regional economies as revenues from coal production in individual States are affected. No analysis has been made of the social costs of the shifts in coal production and their effects on employment of coal miners.

- Five States--Ohio, Missouri, Indiana, Pennsylvania, and Illinois--that account for 50 percent of the projected reduction in 1995 SO_2 emissions would have higher electric utility capital expenditures, higher electricity prices, and lower State coal production with this legislation. In the base case with the legislation minus the base case projected without it, the increases in capital expenditures for the five States range from $185 million to $1,037 million (in 1980 dollars). Electricity prices increase 1.2 to 3.3 mills per kilowatthour (in 1980 dollars) among the five States, and State coal production in 1995 would decline by 0.3 to 37 million tons.

Benefits from the proposed amendments include improvements in air quality. Additional environmental benefits may occur from improved water and wildlife, agriculture and forestry, greater longevity of man-made structures, and better human health. Because such benefits are as yet unproven, it cannot be determined if their value will be more than, less than, or equal to the total costs of reducing emissions.

As stated earlier, this analysis assumes a minimum-cost response by electric utilities for complying with the legislation. These projections are based on current laws and regulations, and as such they can be viewed as likely only if no future changes in laws or regulations occur. If additional coal mine safety laws are enacted in the future, or if restrictions are placed on electric utilities in their selection of options, the cost increases will likely be higher than those reported here.

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[2] Energy Information Administration, Office of Energy Markets and End Use, Monthly Energy Review, DOE/EIA-0035 (83/04) (Washington, D.C., April 1983), p. 92.

Secretary Hodel. Frankly Senator, today I think the world oil price is above the price that the market would dictate if it were a free market. The OPEC countries argue that they cut the price and they didn't see a consumption increase. I responded, had you not cut the price I think you would have seen an even more drastic reduction in consumption of oil.

In the United States alone we see with the natural gas, oil tradeoff, so whatever we do with regard to price in one fuel has its corollary in the other. And underlying all of this is your concern about conservation and renewable, one of the biggest problems I have as the Secretary of Energy is to try to maintain momentum for conservation and renewables at a time when the perception is that there is some kind of a glut. I talk about this a lot but you don't see a lot of coverage. It isn't very newsworthy yet. It will be the day there is an interruption of some kind.

Senator Evans. You'll sure have one vote from this committee in the Senate in pursuing that line of endeavor. I think it's a terribly important one, both in terms of this empty seat at the bargaining table and also in terms of our own oil, I'm not at all sure we're talking about the environmental cost, however, the acid rain and other environmental costs.

In your view, do we have some environmental costs which may well be applied or ought to be applied to the burning of petroleum products, particularly in our station power centers which are somewhat similar to the burning of coal? And in effect those prices aren't being fully recognized. The cost of environmental controls which need to be applied to our oil-burning plants as well as our coal-burning plants.

Secretary Hodel. I sometimes say with some gratitude I'm not an economist, therefore I'm afraid once I get into the sticky terrain of costs which have not been internalized into the system, it becomes from my understanding a very sticky wicket. Some costs we are prepared to state clearly belong on the facility, the safety cost of nuclear, the ash and emission controls on coal, have to this date been imposed on the system. Now there is some talk as you and I both know that maybe the solution is to just bury some of the additional costs of controlled technology in the system and not put them on the fuel. That will affect, if we in effect subsidize the price of one fuel by saying burning it cleanly is a burden to be borne broadly in the country, not by the fuel itself. We would change the competitive mix between that fuel and alternatives including conservation.

Senator Evans. I understand you well and I'm not sure that's the right thing to do. We'll face that one I guess at some future date.

A couple of different questions. To what degree are we really moving ahead in your view adequately enough on these alternative energy supply investigations? I know that there has been a special emphasis in recent years on nuclear. I am also more than a little aware of some of the current difficulties in the nuclear field. I got into some considerable trouble with conservationists in my own State, not because I just voted to continue breeder reactor research, but because I said, I said I was doing so as an environmentalist, and it was hard for them to understand that. But I believe the current and pressing problem not only of acid rain but of the greenhouse effect, mandate continued intensive research on alternative fuels. And I'm particularly interested not just in nuclear but some of the other renewables but even more important than those a potential which I personally believe could have some enormous impact if the economics can be ultimately worked out and that's in the use of hydrogen as a fuel. How much is being done and how much do you contemplate asking to be done along those lines?

Secretary HODEL. One of the issues that has confronted me since becoming Secretary is the manner in which I try to provide a legitimate basis with the Department for studies across a range of alternatives because we are committed to balancing a mixed energy resource base in the country, not just conventional resources but also with renewables, solar, geothermal, ocean thermal energy and the like, as well as conservation. I think there will always be disagreement as to what is the proper level that we should carry in each of these areas because frankly every one of those technologies has its proponents and each will assert with confidence that the solution to America's future lies in focusing essentially all of my attention on that one area. At the moment that's not observably true and it seems the most responsible thing for the Department of Energy is to try to continue to push the barrier of cost and technological problems, safety, health, and the like, across this whole array of options. And I think you will see when we come forward with our budget that we've once again made an effort to improve the balance and carry forward in a host of areas particularly in the renewable area. There's no question renewables would be hurt by the change of the price of oil, that the incentive has diminished. It's interesting to me, I don't think the incentive has diminished only because of cost, however. I think it has diminished partly because of attitude. This attitude of well we've got a surplus or loss of availability of alternative fuel. And if we can get a realistic appreciation of that I think it's one of the most shortsighted things in the world for someone building a new facility today to assume that tomorrow's energy world will look like today's, especially after what we talked about the possibilities for interruption.

We need a better way. I do not have a proposal or solution for you at this time. * * * A better way to communicate that fact to the American people. We are struggling with it, we have not succeeded with it well, and I don't happen to believe that the solution to the problem would be vastly increasing Federal expenditures because in the magnitude of the responsibility out there, it's so great that just in weatherization alone, the weatherization being carried on by the Federal Government will not weatherize all the homes in this country in real lifetimes. That's not where it's got to come from. The incentive and enthusiasm and support for that has got to come closer to the person living in that home.

Senator EVANS. I agree. I think perhaps the Federal responsibility lies more in either directly or through the incentive programs, getting at the fundamental research. Once you get down to the application of that I agree with you, that has to be done. The application ought to be on a cost-effective basis which would make it in everyone's best interest to do it because it was just cost effective to do so.

Secretary **Hodel**. Absolutely. And you've touched on an issue that has gone around and around within the Department since I've been there and that is the question of technology transfer. It's absolutely imperative, it's one of the least effective efforts that really anybody makes. It isn't just the Federal Government. I suffered with this problem when I was in the Electric Power Research Institute. Good work appears to have, value needs to be transferred to the user in a way that gives the user a chance to take advantage of it. And it is not just in our research that we have that problem, and we are continuing to work with it, Senator. I don't promise you a solution but I can tell you we clearly see that need.

Senator **Evans**. Thank you.

The **Chairman**. Senator Hecht.

Senator **Hecht**. Thank you, Mr. Chairman.

Mr. Secretary, I'm glad you said you are not an economist because last year when I came here I was reading all the economic forecasts and I've gone back and reread my files from last year. Every one of them were wrong. So maybe that explains why you're doing such a good job.

I want to switch from that area of the world to Mexico. What is the current concensus on Mexico's oil resources?

Secretary **Hodel**. Senator, I don't have a definitive answer on Mexico's energy reserves. I'll be happy to supply that for the record. I know there has been some speculation that their reserves may have been overstated in the past or may for other reasons have to be revised at this time downward, but I don't have numbers.

Senator **Hecht**. How about other parts of Central America?

Secretary **Hodel**. Again, I have none of those at my fingertips Senator. I'd be happy to try to supply those for the record.

[The information follows:]

WESTERN HEMISPHERE ESTIMATED PROVED RESERVES AND OIL PRODUCTION [1]

	Estimate proved reserves January 1984 (1,000 bbl)	Estimated 1983 oil production (1,000 b/d)
Canada	6,730,000	1,396.0
Argentina	2,428,700	481.0
Barbados	600	0.5
Bolivia	160,500	22.0
Brazil	1,800,000	315.0
Chile	748,000	39.0
Colombia	560,000	155.0
Ecuador	1,675,000	236.0
Guatemala	48,000	7.5
Mexico	48,000,000	2,702.0
Peru	775,100	171.0
Trinidad and Tobago	630,000	158.0
Venezuela	24,850,000	1,791.0

[1] Excluding the United States.

Source: Oil and Gas Journal, Dec. 26, 1983.

Senator **Hecht**. OK. In conjunction with Senator Metzenbaum's question, that could be very important toward stability in a crisis.

Secretary HODEL. You are looking I take it Senator, for an indication of the expected reserves in our Western Hemisphere suppliers?

Senator HECHT. Exactly.

Secretary HODEL. And therefore what the long term projection would be for the per day barrel of oil rate that they could sustain?

Senator HECHT. Yes.

Secretary HODEL. I'm sure we could supply some information on that.

[The information follows:]

Mexico's proven oil reserves are currently estimated at 48 billion barrels. Ultimate recoverable Mexican crude oil resources have been estimated at 65 billion barrels in a recent Energy Information Administration study, entitled The Petroleum Resources of Mexico. This estimate is at a 95% probability level. In Central America, Guatemala is the only country with proved oil reserves, currently estimated at 48 million barrels. Oil exploration efforts are underway in other Central American countries, particularly Costa Rica, but to date we are unaware of any discoveries. In 1983, Mexican oil production stood at about 2.7 million barrels per day and Guatemalan production at about 7.5 thousand b/d. Mexico's daily sustainable oil production rate is projected to range between 2.5 and 4.5 MMBD in 1990 and between 2.5 and 4.3 MMBD in 2010. Similar projections are unavailable for Guatemala. The attached table shows estimated proved reserves and 1983 oil production for other Latin American countries.

Senator HECHT. Thank you very much. No further questions.

The CHAIRMAN. Thank you very much.

I would note one problem. I would hope we could limit ourselves unusually on the second round so that we could get to the distinguished panel that will follow. I will limit myself to one question and submit some others for the record, because I am anxious to hear from the other gentlemen who are here to testify.

One question is simply this, Mr. Secretary, in 1983 the United States imported about 5 million barrels of oil per day. About one-third of our total demand. Right now U.S. oil production is 6 percent less than it was in 1973. For the lower 48 States, subtracting the Alaskan production, U.S. oil production is now 23 percent below 1973 levels. You've noted in your testimony as well as in your remarks here today that most of the projected increase in OECD oil consumption is expected to be concentrated in the United States.

If our production is declining as it is, and our economy improves, and there is a prospect of significant growth in U.S. energy consumption, doesn't that indicate then that our future dependence on imported oil will increase?

Secretary HODEL. Yes. Senator, in my opening statement I think that explains why we see a possible increase, depending again on other factors as well, such as the rate of economic growth to a high of as much as 6 million barrels a day. We think that's outside, but possibly 6 million barrels a day in 1985. We don't know that for sure but it's the net of those effects that lead us to that conclusion. What we don't know is how much offsetting structural conservation has in fact taken place.

The CHAIRMAN. I certainly agree with your response to Senator Evans' question. I agree with what Senator Evans was saying, that we need to be looking at those areas. But the response was a balanced program in which we look at all of those factors including conservation, renewables and energy shifting. But in any of those scenarios what I see is an increasing dependence as we limit further production and exploration upon offshore regions, as we deal with the question of what we do in the frontier region in Alaska, the acid rain problem, the greenhouse effect, the imposition of restraints or additional direct costs upon the budgeting of hydrocarbons. All of this leads me to believe that we may well be looking at a period in the not-too-distant future, but a predictable future, of some matters that ought to be causing us concern in the direction of policy today. Not the least of which is increased dependence. Many of these are long-lead time items. If we talk only about the application of a breeder reactor or what some people would look to as a fusion reactor, those are things that we're talking about having application at the end of this century or well into the next century, and yet the dependence upon what we know how to do now, fossil fuels, conventional nuclear, conservation, those are things which are not adequate to the immediate future in the event of massive shifts in oil production.

I'm very much concerned that we're treading a fine line between necessity, or a sense of urgency to drive us toward policy and the very real prospect as Senator Metzenbaum said, if we say it too loud the price will go up in the world market. How do we create a sense of urgency without that kind of economic response? Those are dilemmas.

Secretary HODEL. Mr. Chairman, I agree. We have two things we're looking at. One is what kind of emergency response do we have if something untoward happens, and the other is a longer term issue: increasing dependence on oil. We see decreased drilling for oil, decreased drilling for natural gas in the country, although the oil drilling has been increasing slowly; it's nowhere near the level it was to retain our reserve level and our annual production figures. We're seeing declines in that partly because of the uncertainty over the legislation Congress will produce, partly uncertainty in the case of oil of what the price will be. We have managed as a nation to throw obstacles up before each of the major resources that are available to us and really have not come to a national concensus on some convention of a balanced and mixed energy system that's appropriate, and to do that we ought to have available these resources at the least cost to the consumers instead of at the highest cost to the consumers.

We've not resolved that problem.

The CHAIRMAN. Thank you very much. I'll reserve the balance of my questions. I'll submit them for the record.

Senator METZENBAUM. I too have one question. I'm glad that your responses to Senator McClure finished with respect to the issue of cost to the consumer because you told Senator McClure at an earlier point that first response the administration would make in the event of an interruption in supply if needed, if there was a reason to do so, would, it would go for an early and immediate drawdown of SPR. Is that a fair statement of what you said?

Secretary HODEL. I think what I said was the first thing we would do was try to determine what happened. The second determination we would try to make is how severe is it and how long is it likely to last. And based upon those factual determinations, assuming that it was going to be for some duration and it didn't result in a deminution of the oil available to the United States, that it was our decision in the last tests we ran to go ahead with the strategic petroleum reserve drawdown.

Senator METZENBAUM. Then I have to ask you what day of the week did you change, since on October 5, 1983, the Washington Post has a good picture of you here testifying somewhere, it says, "In the event of a Persian Gulf oil crisis, the Reagan administration probably would not sell off crude oil from the Nation's strategic petroleum reserve simply to keep a nervous market from sending oil prices soaring, Energy Secretary Donald P. Hodel indicated yesterday."

It goes on to quote you and said, "Drawing down of strategic petroleum reserve to change the price of oil was not its intended purpose. It was intended to be for emergencies and I think we have to keep that in mind."

Now are you prepared to change what you said in October?

Secretary HODEL. No sir; but I'm prepared to explain it, because I think it's very clear that what I said here and what I said today are exactly the same thing. I said if there was an interruption of supply to the United States we would turn to the strategic petroleum reserve. That was the time when we presented national energy policy plans to the Congress. What I said then and what I say now is we do not contemplate using the strategic petroleum reserve for the sole purpose of affecting price, as I think some people would like to have us do. Use it as a governmental means of manipulating price in the market. I don't think that's wise. I don't think we're wise enough to do it effectively. So we look at the reasons why we use the strategic petroleum reserve. It is strategic, it is a petroleum reserve. We'll use it when there is an interruption of supply which affects our availability of petroleum in the United States.

Now in so doing, clearly we are going to have an effect on price. We're going to have an effect on our allies. We'll have effect on producers. We'll have effect on domestic stocks as well. All of those things will be effected by it. Those won't be the primary reasons why we decide to use the strategic reserve, however. There will be outfall from it. Therefore, what I said there and what I've said since, it's not that we've changed our position. The emphasis that was on the question I received, would you use the strategic petroleum reserve to hold the price down. I said no. I didn't understand that Congress created a strategic petroleum reserve to cause the Federal Government to try to manipulate the price market.

Senator METZENBAUM. Am I then to understand that you would permit prices to go up as high as $98 a barrel which is what your Department, what your mock study concluded they would rise to? They would still not use the petroleum SPR?

Secretary HODEL. I appreciate you raising that $98 because it gives me a chance once again to clarify that that was in a test, and the assumption in the test was that we were in the spring of 1981, not 1984, and we had to use the numbers that ran around in 1981. In 1981 as you know, President Reagan had just come in; we had not commenced the rapid fill rate of strategic reserve. There were about 100 million barrels in storage, so small, about 17 days' supply, that it didn't have a significant impact on that test. It wasn't contemplated by my staff to be utilized. That was one thing. Our imports were higher in the United States than they are today, so it was a different world. And I think I've expressed myself many times that in the 6 weeks the price went up reaching $98 a barrel in this particular model, occurred before I was finally brought in and asked, Mr. Secretary, would you like to become involved in this process. I suggested that Congress and the White House would have gotten me involved much, much earlier in a real world situation. So that test should not be taken out of context and abused or misused to create impressions about prices that will occur. I think that the strategic reserve would become used in that situation long before the price hit $98 a barrel because in that situation there was an interruption of supply and that's what we would be using it for.

Senator **Metzenbaum**. That's what the question was back in October. It says, "In the event of a Persian Gulf oil crisis the Reagan administration probably would not sell off crude oil" and it goes on.

Secretary **Hodel**. Senator, the question that I think I was answering was in the event of a Persian Gulf interruption would you sell oil in order to reduce the price of oil for price manipulative purposes? In other words, and my answer which was quoted there is not inaccurate, but it has to be read in the proper context which is we won't try to manipulate the price in the market. What we are going to use the strategic reserve for is to displace and replace lost oil supply. That's what it's for in our estimation, that's how it ought to be used.

Senator **Metzenbaum**. I thought I could understand the English language. I'm not sure I understand. If there is a crisis, the price is going to go up. Now you're saying but we're not going to use it to manipulate price. Now I don't understand how you make that distinction.

Secretary **Hodel**. You're making an assumption that isn't proven by the record to date and that is you can have an interruption or a perception of an interruption.

Senator **Metzenbaum**. An oil crisis. Not an interruption, an oil crisis.

Secretary **Hodel**. Then I have to have your definition of crisis because if it is an interruption that's below the level of replacement capacity or if it's an interruption that is a 1-day or 2-day interruption, the chances of it affecting the price of oil are very slim. I don't think you can just say that an interruption is an interruption is an interruption. Not all interruptions are alike. They don't have the same effect and therefore much greater refinement is required than simply saying there's an interruption, let's bring the Federal Government into this with both feet and stir around in the market.

Senator **Metzenbaum**. I didn't say that. I said an oil crisis which is what this article is about. "In the event of an oil crisis" you say you wouldn't——

Secretary **Hodel**. Senator, if we really wanted to get to the bottom of it we'd have to take a look and see whether the article accurately reflects the whole story there. I have no quarrel with the quotation you read me from my part. I think it was in the context I've indicated. Not necessarily just would we use SPR as you've indicated.

The CHAIRMAN. Senator Murkowski?

Senator MURKOWSKI. Thank you.

In view of the discussion that has occurred over an extended period of time about the vulnerability of the Strait of Hormuz, what is your assessment to the actual facts that appear to be underway to alleviate some of the concerns about moving vessels through that area by the proposed construction of pipelines across Saudi Arabia, up through Turkey, and I think there's a third one. Aren't, in reality, we resolving the crucial strategic active position in the ships by coming up with an alternative way of moving the oil and, in fact, reducing the threats if in reality these pipelines are built?

Secretary HODEL. Senator, there's no question we reduce the significance of that single choke point by any such alternatives. The utilization which has been referred to widely in the press, additional tanker storage by Saudi Arabia, is also, has that effect. Our strategic reserve does also. So the efforts that are going forth to provide other outlets for the Persian Gulf certainly move in the right direction.

Senator MURKOWSKI. Isn't it quite likely then the threat in the Strait of Hormuz won't be what it was, and the other alternatives will undoubtedly be available and it does appear there is a self-perpetuating instinct in the Mideast countries not to totally anihilate each other's cash flow as they make their particular points of view, so aren't we seeing kind of a resolve, if you will, of what has previously been a tremendously crucial area of concern to the world's energy supply?

Secretary HODEL. Senator, it's a longer term resolution, and the problem that we have is the gulf area contains such a large share of the world's known oil reserves that if someone were determined to prevent the export of oil from the gulf today it's easier by blocking the gulf than it would be later if you had pipelines, but it is also possible to interdict pipelines. So once we start the preparedness scenario which says what if, the fact that it may be less significant to block the gulf doesn't prevent us from having a situation postulated where somebody blocks the gulf and interferes with pipelines that have been built. In the analysis scenarios, we can always play that game and so it's an improvement, but there is ultimately no answer if someone in the world is determined and has the force available to interrupt the supplies on most any commodity, they can do it.

Senator MURKOWSKI. It's my understanding that currently about 3 percent of our domestic crude oil consumption originates in the Mideast. Nevertheless we maintain two naval task forces in the area. We maintain a station group of AWAC aircraft monitoring the situation. We have some of our military bases in the United States specifically in a state of readiness to support that area, so we really put our resources and support on the line in the Mideast.

In view of the lessening of our dependence it occurs, and one has to ask, are we carrying somebody else's water? Japan imports more than 60 percent of their crude oil from that part of the world. West Germany, 37 percent; Spain, 60; South Korea almost 80; and these nations obviously make little contribution to maintaining peace and stability in relationship to ours which is very real in the naval task force and AWAC's.

My question to you is do you feel your Department has any overriding concern in influencing our foreign policy decisions in that regard that may make a justification for more participation from some of our allies?

Secretary **Hodel**. Senator, we do participate with the rest of the administration in preparedness activities and we have specifically done so in this area and we'll continue to do so. We pointed out the energy dependence of the United States even though our actual consumption is at the three percent level out of the Persian Gulf. The fact is this is an interdependent world oil market. The United States allies and its trading partners are very heavily dependent as you've outlined, and the consequences to our economy and to our people of an interruption in the Gulf indirectly resulting from their having been hurt is almost as severe as if we were much more dependent ourselves and didn't have an international world oil market. So the consequences are sufficient that we can justify being concerned about the outcome. I'm really not the best person to try to answer you with regard to the appropriate level of U.S. preparedness in response to the military side.

Senator **Murkowski**. I assume your presumption and mine are somewhat the same. In fact the deployment of two task forces in the area and the capability with the AWAC are probably there to make sure that the straits, that there's no effort to blockade the straits, and if there is, we would attempt to thwart that blockade. But indeed we are packing the burden if you will of maintaining stability in that part of the world which brings me to my next question and observation concerning the balance of payments deficits which the United States presently has which are about $64 billion if my memory serves me correctly. These were announced the day before yesterday. About $21 billion with our friendly ally Japan. And it occurs to me in both Japan, Korea, and Taiwan, both of whom are totally dependent on other sources of energy, are buying this energy in other areas of the world but not North America. Why don't we and why doesn't your Department direct attention more to try to make energy available from North America in relationship to this growing deficit balance of payments?

We've got coal, we've got oil, we've got gas. Why aren't we out selling some of our oil and gas and our coal? We're not shorting ourselves by taking advantage of transportation savings surely. Why do they buy from everybody else but us?

Secretary **Hodel**. The answer I believe is that they are buying as we do in a world oil market and they're buying it from the sources that are the least cost to them that are available. And as you know, Senator, there are some legal restraints on our ability to sell from at least parts of the United States. As you know we have a United States-Japanese energy working group as a result of the President's meeting with the Premier and the whole thrust of that meeting has been to try to find ways in which we can market more energy. Coal, oil, liquefied natural gas to Japan. They give us every indication that they are willing to pursue it but as you know it is not as simple as entering into a contract and simply doing what makes economic sense for both countries.

Senator MURKOWSKI. It's my understanding if you put all the oranges and apples together as well as leave and take the restrictions away that Japan has, you're only talking about half a billion dollars over 5 years, and my question is do you think we can do anything positive over the balance of payments deficits unless we get into the energy business and start selling overseas?

Secretary HODEL. I can't comment on the rest of the economy but I'm convinced that the United States has potential as an energy supplier to the rest of the world and is one of the more promising areas where we can do something and it isn't just oil and liquefied natural gas and coal but it's also nuclear technology and fuel and the like. We are concerned about all that. But as you know there are serious efforts to impair and impede our ability to participate in that way. There's a constituency to most energy components in our society. It's not always the same constituency. I don't know what all the motivation is. Some of it's clearly commercial. But whatever, we don't have an open shot at a lot of the market.

Senator MURKOWSKI. It would seem to me if the best customer Japan or the best customer Korea or Taiwan, the United States ought to be able to dictate something in terms of conditions and one of them ought to be sales of energy to these countries that are dependent and buying it from all over the world.

My last question Mr. Chairman is with regard to a statement that was attributed to you, that has been made by you Mr. Secretary, in Plat's Oilgram News, January 26, and before I make my reference to it I might comment on a statement that has been made by your Assistant Secretary of Energy, Jan Mares, at a hearing concerning the appropriateness of Alaskan oils, and I think if I'm quoting him correctly he stated that our view is lifting the Alaskan export ban, would enhance our energy security by increasing domestic production, increasing U.S. net oil imports, by increasing the flexibility of the world oil market to adjust sufficiently to unexpected supply distribution, excuse me, disruption.

And he further states in terms of energy security lifting the ban also has positive effects. Reduction in the U.S. net oil import makes us somewhat less vulnerable to oil supply disruptions, et cetera.

You were quoted, and I don't say quoted because I don't see any quotes here, but it was attributed to you on another subject.

The Secretary said there is no chance that Congress will permit the export of oil—gas from Alaska. He said he would be in favor of such exports if they were in the national interest but at the moment don't think it's one of the options.

Would you elaborate a little bit more in view of my amendment 22 of the Export Administration Act which would propose to allow 200,000 of the 800,000 barrels a day that's in excess, that's moving from the West Coast of the United States to the east coast, and the proposed amendment 200,000 barrels in U.S. bottoms to be exempt from the Export Administration Act, go out and find out wherever there might be a market with the provision that the President could cancel that under contractual terms and the state of a national emergency.

Secretary **Hodel**. At the time I answered that question I wasn't aware of your current proposal which may very well offset some of the resistance which I've observed in the last year. My position has not changed. Jan Mares, I think, has correctly stated the analysis which we've looked at with regard to the export and the fact that if it makes sense it ought to be done. I've had the impression that the chances of legislative action were nil. It may be possible. I hope I'm not throwing cold water on your proposal. I would think that you may very well have structured something which helps eliminate and remove some of the opposition. Hopefully that would provide a new look at the issue but I have not up until now had any feeling that there was movement in that area.

Senator **Murkowski**. I'll be happy to send a copy of my proposed amendment and I would very much appreciate your review of it, and indeed would hope that the balance of the administration would take time to read it. I think it merits some support and it is significant in this regard.

Thank you, Mr. Chairman.

The **Chairman**. Thank you. And I would apologize to the witnesses, both the current witness and the panel that will come. It's necessary for me to leave at this time, but Senator Warner will chair and look forward to your testimony. I have your prepared statements and I very much appreciate your appearance and testimony this morning.

Senator **Warner** [presiding]. One brief question, Mr. Secretary. I've read through your statement and I understand you have made reference this morning to the Iran/Iraq situation. Perhaps you saw the report in today's Post about threatening embargo of oil moving up to that area. Did you see that?

Secretary **Hodel**. I did not see the article.

Senator **Warner**. There are a number of articles leading to prudent observation that something is going to happen in that area. How do you monitor that situation? Through your interagency contacts with State and Defense, or internally do you file or a combination?

Secretary **Hodel**. It is a combination. We have relationships with State, Defense National Security Council, CIA and the like, and we also have an internal intelligence group which I think primarily deals with the production from the intelligence community and attempts to keep us posted on the events of significance.

Senator **Warner**. And in a closed hearing that we had with the Energy Committee last week, we were provided with classified data on the subject. To what extent can you elaborate in open session today on your appraisal of the Iraq/Iran situation and its potential for causing interruption in the world oil supply?

Secretary **Hodel**. It is obviously anybody's guess but my opinion, based upon what I have heard, I hope not in intelligence reports but what I've heard in general, in the meetings I've had with representatives of other companies. If I had a bet I'd bet that there would be some kind of prohibition, if I can use that word, in the next year. But I don't know whether that's the sinking of one tanker or the threat to do so or an announcement that the Strait of Hormuz has been mined, but in fact not mined and so on. There are so many alternatives available to the participants and I don't think today they know what they will do because these are unfolding events and circumstances and the needs and drives of the various parties will determine what they do. So our job is to try to be prepared on an across-the-board basis to respond rather than targeting an assumption that someone will block the strait.

Senator **Warner**. Then there's every reason to believe that this calendar year we will push ahead as strongly as we have in the past and look for alternative fuel sources in coal and the like?

Secretary **Hodel**. Yes, sir.

Senator **Warner**. No deemphasis?

Secretary **Hodel**. I hope we can improve our emphasis on that.

Senator **Warner**. There may be additional written questions from the rest of the committee, and if the members present have no further questions, I suggest we proceed now to the panel.

Thank you, Mr. Secretary.

Senator **Murkowski**. I have a short statement I'd like included in the record.

Senator **Warner**. I'll introduce the panel and we'll proceed with the statement.

Senator **Murkowski**. I don't want to read it, I just want it in the record preceding the panel discussion. It would be appropriate as an opening remark.

Senator **Warner**. Without objection.[1]

The first member of the panel this morning will be Anthony Cordesman, international policy editor, the Armed Forces Journal.

The second will be Dr. Melvin A. Conant, president, Conant & Associates. And Ambassador Hermann F. Eilts. And we'll ask each of the witnesses to proceed and we'll have a round of questions.

Senator **Metzenbaum**. I want to hear all three of them and I know you do and I heard you say you had to leave at 12:30. I wonder if you could establish whatever time period you want so that each of them may be heard for *x* number of minutes and therefore each of them will have an opportunity to be heard regardless of the order and we might have a couple of minutes left for questions.

Senator **Warner**. I suggest each be heard before questions, and Mr. Cordesman, how much time do you need to do justice to your initial presentation?

Mr. **Cordesman**. I think about 5 to 7 minutes.

Senator **Warner**. We should have ample time for questions thereafter. Thank you, gentlemen.

STATEMENT OF ANTHONY H. CORDESMAN, INTERNATIONAL POLICY EDITOR, ARMED FORCES JOURNAL

Mr. **Cordesman**. Senator, I have prepared a detailed statement and attachments and will attempt to summarize those to give a history of the war and attempt to summarize the current military balance on each side.

Let me go right on to the punch line which is the possible outcome or at least course of the war over the next 1 to 3 years. I think there are four possible outlets. The most favorable one is the shift in the current war of attrition to one where Iraq can endure without massive escalation, either in the form of an all out air attack on Iran's oil export facilities or some major counteroffense proposal which has been raised by at least some Iraqi officers.

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[1] Senator Murkowski's prepared statement appears on p. 10.

I think that much of this depends on the course of 1984. If Iraq can raise its oil export capability from something like 700,000 barrels a day or 900,000 to somewhere around 1.8 or more over 1984 and early 1985, if it can keep aid coming from the gulf states and if it can keep arms flowing from Europe, it will have the economic and military resources to endure in this conflict and possibly wait out Iran.

I have to stress this is not peace. This is a war of endurance. There's a month by month list of Iran lashing out at the rest of the gulf, U.S. forces. There will be a continuing struggle between Sunni and Shi'ite, and I think we will see the threat broadened to include North Yemen, Bahrain, Syria, Kuwait, and the eastern province of Saudi Arabia. In other words, we're talking about years of confrontation, military buildup and uncertainty. We also cannot rule out successful Iraqi strategy to lead the Iranians into attacking the United States and the rest of the gulf.

I think yesterday's announcement that Iraq would attack tankers and ships in the vicinity of Kharg Island is a good case in point. It is very tempting as Iraq comes under pressure to attempt to export the conflict or broaden, to bring others in on its side. I also have to say that no one can predict at a political and military level the point of endurance that Iraq will reach. Historically, I don't think that any military analyst has ever been able to see the time which a war of attrition would cause something to break, either militarily or politically. The next outcome would be some kind of mass Iraqi air attack on Iran. I believe this would fail.

From what I've seen in Kharg Island during the time I was stationed in Iran and what I've seen done to it since, I do not believe that the kind of capability that Iraq has could in fact do serious long term damage to Iran's oil export capabilities on the island. It could do serious damage, at least temporarily, to the ability of tankers to move to the island but even there the capabilities are limited. Their best aircraft, the Super Etendards would have comparatively limited—time over the island. It could attack individual tankers but not patrol the area. It does not have other fighter aircraft which could perform that mission.

I think if Iraq went from threats to execution the failure would also be public enough so it might well bring down its current regime or exacerbate the military problems, the tensions within Iraqi forces. In other words, I think this threat should it not succeed in immediately provoking the Iranians would probably mean an Iraqi defeat in the war. So the execution in many ways is as dangerous to Iraq as it is to the West.

The next outcome would be Iranian escalation, and I think the form that this would take would be one or more of the two major options. The first would be to somehow come in with direct military confrontation with U.S. forces in the region. There are too many tensions building up to rule out that option, not only in the gulf but in Lebanon and the rest of the region.

Another would be to launch an all-out mass mobilization and offensive. I think these responses would only be headed by a successful Iraqi attack on Iran export capabilities or a major interruption in Iran's oil. Neither of these options is one that is predictable. We're dealing with a very unstable regime. We can't really predict its behavior. Iran has, however, already escalated the war in terms of terrorism and subversion. The southern gulf is extremely fragile and Iran can put much more pressure on the southern gulf than it has put today.

Another outcome would be one of a true oil crisis. I personally do not believe that this is a very serious option if the United States is willing to act decisively against Iranian Naval and Air Forces. They would not be able to seriously threaten the strikes. They don't have the air power left. I don't believe the Iranian Navy was terribly effective when the Shah was in power. I cannot believe that after the current—it is particularly effective now. It really depends on U.S. will.

What I see as far more threatening is the fact that many of the southern gulf states have a few highly vulnerable facilities, water facilities, certain highly concentrated oil facilities, certain political weaknesses that Iran could strike at. I'm not sure how those states would react under pressure. Some might be firm but almost all would have to be firm and act in concert to sustain oil flows, even if we kept the straits open.

In brief, I think that leaves us about five options where the United States has some kind of military action it can take beyond what's already been done. One might be a clear warning to Iran of what the United States might do to keep the gulf open. I think it is dangerous to leave this ambiguous, particularly if Iran gets the impression it might involve interference in Iran's internal affairs. I think it is also dangerous to follow the policy of a gradual escalation. If we don't act decisively, I think there is a risk that we would simply make things worse.

We have not done too well in collective defense planning in the gulf, either with our allies or with the gulf states. This is an area for improvement. We would encourage our Arab and Western friends to provide even more financial and military aid to Iraq. We could consider cooperative economic sanctions against Iran, at least as some sort of declaratory action that might have an impact on Iran.

And finally, I think we might communicate the limits of our actions to the U.S.S.R. There is a serious risk that if we do not, they may take any major U.S. action as being intervention in Iranian affairs and on their border area. We tended to think of the—gulf only in terms of the United States versus Iran or Iran versus Iraq. I would simply suggest in conclusion that those risks are considerably broader and might have much more impact on our energy supplies.

Thank you.

[The prepared statement of Mr. Cordesman follows:]

THE IRAN-IRAQ WAR IN 1984:

AN ESCALATING THREAT TO THE GULF AND THE WEST

By Anthony H. Cordesman
International Policy Editor
The Armed Forces Journal

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The Iran-Iraq War is not a forgotten war, but it seems a distant one compared to the more publicized fighting in Lebanon and El Salvador. It also is a war which seems to "cry wolf". In spite of its potential threat to our security interests, it has so far had little impact on U.S. energy supplies.

The past, however, may not be prologue to the future. The war has already damaged US security interests in several subtle ways. The war has escalated during the last year. While Iraq seems to be doing better in the present war of attrition, the conflict could still explode this spring or summer. Even if the war does not produce a major oil crisis, it seems likely to institutionalize forces that will continue to threaten Western oil supplies for the next decade.

THE EXISTING THREAT TO WESTERN INTERESTS

For the last year and a half, the Iran-Iraq War has been a war of attrition. There have been no explosive battles sinced Iran was checked in its drive on Basra, and it has been easy to forget what would happen if Iran should dominate Iraq or if the war should expand to include other Gulf states. Even this war of attrition, however, has created the following threats to U.S. and Western interests:

o Drastic reductions in Iraq's oil export capability, a massive oil slick in the Gulf, and low level attacks on shipping and tanker traffic in the Gulf.

o Intensifying Iraqi pressure on the southern Gulf states to provide aid and support. This has made the Gulf states targets for an accelerating tempo of Iranian guerrilla and terrorist efforts, and for subversive efforts to use their Shi'ite populations and local fundamentalist and radical movements to put pressure on the conservative Gulf governments or overthrow them.

o Western willingness to supply arms to Iraq has hardened

Iranian hostility to the West. This hostility is reflected in greater terrorist and subversive activity in the Gulf, in Iran's support of radical Shi'ite elements in Lebanon, and in the conduct of "hardline" states like Libya and South Yemen.

- o Broader Syrian-Iraqi ties have turned the conflict into a "two front" war, crippled Iraq's economy, and pushed Iraq towards massive escalation.
- o An Iranian struggle within OPEC to expand Iran's oil export quota, and to raise oil prices, at the expense of friendly states like Saudi Arabia. This struggle may continue even if the fighting ends in a ceasefire or peace. Iran has every incentive to continue it, and Iraq may be forced to fight for its own oil share and maximum revenues once it can resume large scale exports.
- o A split between Iran and France which has further increased Iran's isolation and hostility, and increasingly identified the West as having taken the side of Iraq in the war. The end result has been a new threat of terrorism in Europe and the U.S., growing tension between Iranian and U.S. forces in the region, and the renewal of Iranian threats to close the Gulf.
- o A further acceleration of the regional arms race. This has forced the other Gulf states to expand their own forces, and institutionalized the purchase of large numbers of high technology weapons. This is a legacy that is certain to continue regardless of any near term outcome to the war.
- o The virtual destruction of the economic development and advanced education effort in Iran and Iraq, with the inevitable long term consequence of serious cultural and economic problems in dealing with a young and expanding population.

THE GROWING THREAT OF ESCALATION

These threats would be serious even if the war continued at its present level. Unfortunately, it could be a ticking time bomb. There is no way to know the precise time when the war will explode--and it may well misfire--but the next year should be critical.

Iran must strike before Iraq can restore its oil export capability by expanding its pipeline capacity through Turkey and establishing new export links through Jordan and Saudi Arabia. Iraq must find the strength to wait out a brutal war of attrition until these pipelines provide the oil income it so desperately needs to buy both guns and butter.

Estimates differ over just how serious Iraq's economic position has become, its total casualties, the stability of Sadam Hussein's regime, and the situation on the front. It is clear, however, that the war threatens Iraq's existence as an independent and secular state.

The situation in Iran is equally threatening. Iran has steadily increased the tempo of its threats to Kuwait, Saudi Arabia, and the other Gulf states. It has opened a virtual second front in Lebanon, it has concentrated key elements of its remaining air power near the Straits of Hormuz, it is quietly buying large numbers of small craft on the world market, and it has expanded its training of revolutionary and "terrorist" forces. While Iranian rhetoric has always been strident, the tone of Iranian broadcasts and commentary towards the Arab states has become steadily more harsh.

This creates broader threats to the West and its friends in the region:

o Iraq might collapse militarily or poltically and come under the control of a more radical and hostile regime aligned to Khomeini and/or Syria.

o An Iraqi attack on Kharg Island or the tanker traffic to

Iran might, at a minimum, raise the cost of insurance premiums, threaten the smooth flow of oil exports, and lead to a hardening of prices as nations and companies increase stocks. At worst, it could seriously damage Iran's oil export capability.

- o Iranian reprisals ranging from an effort to halt Gulf oil traffic to raids or attacks on friendly Gulf states.
- o The U.S. may have to use military force to secure Gulf oil traffic, and may become involved in a military confrontation or conflict with Iran.
- o A deepening of the already serious division between Sunni and Shi'ite throughout the region. This division affects the security of Bahrain, Kuwait, Lebanon, North Yemen, Saudi Arabia, Syria, and the UAE.
- o Iran might turn back to the USSR in the search for arms and/or aid.
- o A successor regime to Khomeini may treat the U.S. and the West with even more hostility.
- o Massive Iranian aid to any terrorist or subversive group it feels would damage Iraq, the conservative Gulf states, and the West. This may well be accompanied by assassination attempts against the leaders and officials of conservative Gulf states.
- o Although any closing of the Gulf seems unlikely, 8 1/2-9 MMBD of petroleum products, or 17% of the non-communist world's supply flows through the Gulf each day. Only 4-4 1/2 MMBD could be replaced through surplus production capacity that does not have to pass through the Gulf.

World oil prices remain sensitive to the spot market, which accounts for 20-30% of world import purchases. Even a short term interruption could raise prices significantly at a critical time in world economic recovery, and an interruption of several months might drive prices as high as $40-45 per barrel.

The worst threat of all is that the war could make Iran the dominant power in the Gulf, destroy the present balance between the most populated and well armed Gulf states, and give Iran the ability to threaten every conservative or moderate regime in the region. At the same time, there is an only slightly less dangerous risk that the war could lead the superpowers to intervene in region where it would be difficult to prevent a major confrontation.

THE CURRENT MILITARY SITUATION

The war has been a war of attrition for several years. This process of attrition has been shaped by the following events: Iran cut Iraq off from its oil exporting facilities in the Gulf in November, 1980, forced Iraq to abandon its conquests in Southwestern Iran in March-May, 1982, and persuaded Syria to cut off Iraq's main pipeline to the West in April, 1982.

Iraq, however, has checked Iran's offensives since Iran reached its highwater mark during its offensive against Basra in August, 1982, and Iraq now has greatly superior supplies of modern military equipment. Nevertheless, Iran has bled Iraq of its manpower, its financial reserves, and its ability to borrow or find aid for nearly two years.

Iraq has done more than lose battles. It has seen its oil exports and revenues shrink to 20% of their maximum pre-war value. In contrast, Iran has high oil revenues, and Iran is fighting a political battle in OPEC to raise its quota from 2.4 MMBD to 3.2 MMBD. In spite of massive borrowing, and some $ 20-25 billion in aid from the other Arab states, Iraq has used up most of its foreign exchange reserves and has had to bring a virtual halt to its economic development. Iraq has had to give up "butter" and it is buying "guns" on credit terms that will mortgage a significant portion of its oil revenues for the next decade.

In contrast, Iran has been able to make at least marginal improvements in its domestic economic situation as well as fund the war. It has shown it can sustain much higher casualties and do so using a less expensive and technologically sophisticated force. While Iraq has had to make concessions to its ethnic groups, Iran has continued to dominate its Kurds, Azerbaijanis, and Balucchis by force.

These pressures help explain why the war has escalated at several different levels during the last year:

Iraq's Attempts To Threaten Iran's Oil Exports

Iraq has tried to find some means of putting pressure on Iran's oil export capabilities. It has launched unsuccessful MiG-23 and Mirage F-1 strikes at the Kharg oil terminal, it has struck at ships near Bandar Khomeini and tankers in Iranian waters in the Northwestern Gulf. It has struck at Iranian offshore wells using smallcraft, helicopters, and fighters. It has tried to use the oil spills from these wells, which were damaged by storms as well as the fighting, to pressure Iran for a ceasefire and its neighbors for aid.

During the last six months, Iraq has made every possible effort to obtain military aid that will allow it to expand its threat to Iran and force Iran to reach a "peace" or ceasefire. This helps explain why Iraq gave French agreement to "lend" 5 Super Etendards armed with Exocet air-to-ship missiles so much publicity last summer. Iraq not only tried to use this threat to persuade Iran to a ceasefire, it used it to put pressure on its Arab neighbors and the West. Iraq tacitly announced that it had a "trigger force" it could use to create a Gulf-wide crisis in order to increase the flow of Arab and European aid, and to spur outside support in reaching a peace or cease fire.

"Setting The Gulf On Fire"

Iran inevitably responded in kind. Iran repeatedly threatened to broaden the war to include the rest of the Gulf if

Iraq attacked its oil facilities. In October, 1983, as the time for delivery of the 5 Super Etendards approached, Iran launched major political attacks on France, threatened to close the Gulf if Iran's oil exports were blocked, expanded its naval and martime patrol aircraft activity near the Straits, and emplaced artillery on the Iranian islands nearest the Straits.

These threats forced the U.S. to declare that the U.S. and its allies would keep the Gulf open and led the U.S. to strengthen its naval and marine forces in the Indian Ocean. Japan attempted new peace initiatives, and the world's oil importers conducted a host of new studies to determine the damage Iraq could do and Iran's probable response.

It is important to note that some aspects of these Iraqi and Iranian threats were more symbolic than real. By the time the five Super Etendards were delivered in early November, most analysts had concluded that any use of such aircraft could threaten the flow of tanker traffic to Iran, but not cripple Iranian oil export facilities. They had also concluded that Iran had little chance of mining the Straits of Hormuz or blocking Gulf oil traffic for an extended period of time.

The Super Etendard lacks the endurance to patrol the tanker routes to Kharg Island and the Exocet is only suitable for striking at tankers which have a sharp radar contrast from land targets. It is less suited to attacking a land target with heavy passive and active defenses than Iraq's Mirage F-1s, Su-20/22s, and Mig-23s. It can certainly do a good job of killing tankers in the areas where it has sufficient time over target, but these areas are at least slightly to the northwest of Kharg.

Iran can use its ships, aircraft, and Harpoon missiles to attack tankers and land targets in the Straits, southern Gulf, and Arabian Sea, but it is acutely vulnerable. It has limited air strength, and constant purges of its Navy, coupled to shortages of U.S. parts and munitions, limit its operational capability. While free mines can be a hazard to tankers, the currents in the

Straits and the width of the passages involved exceed Iran's mining capacity. Iran must also use a limited number of bases which no longer have effective surface-to-air missile defenses, and whose sheltering is not sufficient to protect them.

Nevertheless, even a limited threat to tankers raises the spectre of major increases in insurance, of a halt in tanker movements in the Gulf, of another rise in oil prices, and of a confrontation between U.S.-Iranian naval and air forces.

The Super Etendards are also scarcely the only mean Iraq has to escalate the war. Iraq at least 120 Mirage F-1 and MiG-23BM fighter-bombers it could use to attack Iran in addition to its Super Etendards. The risks go far beyond the issue of what Iraq could do with 5 French aircraft, or what Iran could do to close the Straits for any period of time.

Further, Iraq has done more than posture. Throughout the last four months of 1983, it conducted occasional raids on ships in Iranian waters near Iraq. It sank several Iranian warships and in early November it seriously damaged a Greek tanker, the Avra, on its way to Bandar Khomeini and sank another, the Antigoni. In late November, Iraq issued a formal warning to all merchant vessels to avoid the "war zone" at the Northern end of the Gulf.

Iran's Response To Iraq's Threat of Escalation

Iraq's efforts to bring the West into the equation may have had some have had some effect. After the U.S. declared it would protect traffic through the Straits, Hashemi Rafsanjani--the speaker of Iran's parliament--gave an interview that Iran would not have to react if as much as half of its 2.4 MMBD in exports were blocked.

During the second week of November, Iranian President Ali Khamenei stated Iran would not attack Iraq's remaining pipeline "out of consideration for Turkey". This statement may have been intended to reassure Turkey regarding an Iranian offensive which was then underway in the north, and did not prevent

Iranian-backed terrorist activity in Turkey later in the year. Nevertheless, Khamenei was also careful to down play the risk of war with the U.S.

Iran also capped about 100 offshore wells in its Nowruz and Ardeshir fields in December, 1983. Significantly, Iran used concrete at the seabed, a process requiring redrilling once the threat ends. While this did not affect Iran's ability to export at levels well above its OPEC quota, and Iran left some key wells flowing, it represented a significant indication of Iran's concern regarding the Iraqi air threat.

Iranian Unconventional Warfare

At another level of escalation, Iran increased its political and subversive pressure on the Southern Gulf states. This included more viralent attacks on Saudi Arabia and new efforts to encourage Shi'ite insurgency and terrorist action. It may have included an attempt to blow-up a meeting of the heads of the Gulf Cooperation Council states when they met at Doha in Qatar in early November. While Qatar was careful to label the plot's head as a "pro-Libyan prayer leader", it involved some 30 conspirators armed with rocket launchers and mortars, and may well have had Iranian backing.

There is no doubt that Iran expanded its support of Shi'ite and radical Islamic movements outside the Gulf, and particularly in Lebanon. Groups with at least indirect Iranian support--as well as that of Syria--were responsible for a series of bloody car bombings of French, Israeli, and U.S. military facilities, and Iran made a concerted attempt to radicalize Lebanon's Shi'ites and support Syria's efforts to strengthen its influence in Lebanon.

Iran seems to have had some role in the bombing of the U.S. and French embassies in Kuwait on 12 December 1983. Although Kuwait has arrested 7 Iraqis and 3 Lebanese--and freed the Iranian teachers it arrested shortly after the bombing--the group claiming credit for the bombing, the Islamic Jihad, was a

Shi'ite group. Iran also had at least ideological links to the Islamic Amal, the group headed by Hussein Musawi, generally given credit for bombings that killed 63 people in the U.S. Embassy in Beirut in April, and a total of 298 American and French personnel in the peacekeeping force in Lebanon in October.

While Iran has denied any such role in the bombings, Iranian President Ali Khamenei took the occasion of the Kuwaiti bombings to state that, "Iran would not allow the U.S. to enter the region, and let its allies live there, lord over others, and sell oil." Iraq was also certain enough of Iranian responsibility to launch major air raids against Ilam in southwestern Iran and the Iranian border town of Dehloran on December 15th, 1983.

It is also striking that new bombing incidents took place in Ankara and Istanbul on December 21st, that a banned pro-Kohmeini group called the Shi'ite Dawa took credit for the bombings, and that a Syrian and Iranian were arrested in connection with the incident. One of the bombs was directed at the Iraqi consulate, and the incidents followed the discovery of a bomb in a U.S. officers' club some 24 hours earlier.

The Course of the Fighting in Late 1983

The fighting on the ground involved further elements of escalation in late 1983. Iraq launched Scud missile and air attacks on the Iranian towns near the border. The missile attacks were clearly intended to kill civilians and put political pressure on the Iranian government. While Iranian charges that Iraq used gas seem false, the missile attacks did tend to escalate the fighting and Iran replied with artillery attacks on Iraqi towns and civilian targets.

Iran launched another offensive in the north during the third week of October. The offensive took place on a 100 mile front and was directed at the Iraqi garrison towns of Penjwin and Garmak in Iraqi Kurdestan, about 90 miles from the Kirkuk oil fields and 30 miles from Sulaymanayah. Iran claimed it was trying to put its own border towns--Baneh and Marivan--out of Iraqi artillery range and strike at "counterrevolutionaries" supporting Iraq, who seem to have been Iranian Kurds. Iraq claimed the attacks were directed at its Kirkuk fields and at isolating its Kurdish areas and launched new missile attacks on Iranian cities in the south--Dezful and Masjed Suleyman--a claimed to have mined the shipping routes to Bandar Khomeini.

While details of the fighting remain obscure, it revealed a number of trends that may be important in the future. Iran seems to have made good initial use of its infantry against Iraqi positions, and better use of "human wave" tactics than during some earlier offensives in 1983. Such tactics can produce lower total casualties than other forms of attacked on well dug-in positions. The use of volunteers to charge machine guns or walk over mine fields may sound appalling, but it makes sound military sense as long as it is not pushed too hard, as long as successful penetrations are exploited, and as long as the fighting has a meaningful objective.

Iran, however, seems to be so caught up in giving such offensives the character of a mini-jihad that it could not properly control the exploitation of its initial success. . Rather than wear the Iraqis down in a series of carefully calculated blows, Iran continued to try for a massive immediate breakthrough. As a result, it suffered serious casualities. While these probably did not reach the 15,000 claimed by Iraq, they may well have approached 10,000.

Iran again failed to attack simultaneously on several fronts. Various experts speculate that Iran's inability to put broad military pressure on Iraq stems from Iran's lack of supplies and logistic organization, from its acute problems in organizing any major activity in the midst of a revolution, and from its lack of modern equipment. In any case, Iran did not exploit its superior weight of manpower to pin down Iraq on each of the three major fronts along the border, to limit Iraq's ability to redeploy its forces, or to raise the cost in terms of money and lives.

Iraq, in contrast, made good use of fortified defensive positions, and exhibited a slowly growing professionalism in handling limited counterattacks, and in trading space for time and the ability to re-group. Iraqi ground forces remained somewhat overcautious, and were unable to exploit Iran's mistakes or press home major counterattacks, but they showed they were increasingly well led. Iraq also had the advantage of superior access to heavy weapons, and superior strength in operational aircraft and helicopters.

Although the new Iranian offensive continued through October, and Iran launched several follow-up attacks in November, the results were not decisive. Iran pushed 10-25 miles into Iraq and conquered 150-270 square miles of Iraqi territory. It moved within mile of Penjwin, and gained control of the Chilere salient. This put Iranian forces within 75-85 miles of Iraq's pipeline to Turkey, which orginates at the city of Kirkuk. The offensive did not, however, result in any major defeat of Iraq forces, and Iran's new positions did not give Iran a good springboard for a future breakthrough. Iran also did little to demonstrate it could counter Iraq's advantage in armor and air power once it penetrated far beyond its initial starting point.

To put this aspect of the military situtation in perspective, Iraq now has a tremendous advantage in terms of military supply. It is able to buy advanced weapons systems from France, and Saudi Arabia's massive new purchases from Thompson CSF have greatly eased France's cash flow problems in extending credit to Iraq. Tariq Aziz has been able to get relatively free access to additional Soviet arms since Iran suppressed the Tudeh and expelled many of the Soviet personnel in country. Although Moscow claims it is only meeting pre-war contracts, it is lying. Egypt is a source of cheap parts, long range artillery, and other supplies on a surge basis.

In contrast, Iran can obtain the smaller weapons and supplies it needs from Syria, Libya, North Korea, Viet Nam, and Soviet proxies like Bulgaria. It has not, however, been able to get modern armor. Iran is now down from over 1,700 main battle tanks and 250 light tanks to 700-900. It is well supplied in artillery, but it is not getting good Soviet tanks, Western tank parts, or adequate supplies of other types of armored fighting vehicles. Israel is not supplying significant numbers of land or air equipment, and Iran's only current source of Western armored vehicles seems to be limited shipments of German-made light armored fighting vehicles sold by Argentina.

While individual Iranian maintenance efforts can be good, Iran is not able to deploy and sustain large numbers of fighting vehicles, and seems to be experiencing political and organizational problems in coordinating large scale movements and offensives. Most Western observers agree that Iran is not able to use its stocks or imports efficiently and has a very slow moving and inadequate logistic system.

Iran also has not mobilized its full manpower potential. It is impossible to count either Iranian or Iraqi military manpower accurately because of the difficulty of distinguishing between forces designed to serve political or internal security purposes and those which can credibly be committed to the front. Iran does have a superiority in active manpower, and certainly in replacements and the ability to keep manpower in the field without crippling its civil economy.

Iran's deployed superiority is about 500,000-600,000 compared to 380,000-400,000 for Iraq. This superiority is sufficient for a war of attrition--since Iran can sustain much higher casualty and replacement rates than Iraq. It falls far short of the 2:1 to 3:1 superiority Iran needs to put major pressure on all three fronts along the border and achieve a major breakthrough. It is also unclear that Iran has the logistic, organizational, or economic capability to sustain a massive expansion of its effective combat units.

Iran increasingly suffers from the fact that it is losing many of the skills it gained from the U.S. before the revolution. Aside from political turmoil and purges and rivalries within the military, Iran has not provided officer, NCO, or technical training for any significant numbers of military personnel since early 1981. Its military school and training system has collapsed and been replaced by ideological and infantry training. It is living off past capital in terms of key technical and military personnel, and its training system would now have to be rebuilt from the ground up. The ideology of the Khomeini regime seems hostile to the idea of a modern professional military, and it is unclear that the regime is even trying to correct this situation.

Iraq too, has its problems. It is only able to conduct limited training for new weapons and skills. Its educational system has been as badly disrupted by the war as the Iranian system has been disrupted by the revolution, and it has lost the equivalent of at least two years' worth of output from its training system. Iraq, however, benefits from a secular regime and a focus on modern military technology. It has the edge in terms of present and near term improvement in its manpower quality.

In any case, Winter has set in after a battle that must be called a strategic draw. Iran did not manage its offensive well enough to maximize Iraqi losses at a reasonable cost to Iran, or to present any real hope of a major breakthrough. Iraq fought reasonably well, but was far too cautious to benefit from more than local counter-attacks and is not in a position to sustain static defensive losses.

In human terms, the offensive brought the cost of the war to about 240,000 killed (65,000 Iraqis and up to 180,000 Iranians), with three to five times as many wounded, and some 50,000 Iraqis and 8,000 Iranians taken prisoner.

It is unlikely that Iran will do more than launch some probing offensives in the central and southern fronts along the border until the winter is over. There are signs that a limited Iranian offensive is currently in preparation on the central front, but it seems likely that Iran will time its major attacks for the spring and summer.

The War In the Air

The air war has not been particularly intense. A new commander of the Iranian air force has been appointed who has been considerably more agressive than his predecessor, but Iran now lacks the numbers and C^3I capability to confront Iraq. Iran now seems to have only 25 operational F-4s out of a pre-war total of 90, 30 operational F-5s out of a pre-war total of 166, and 5-10 operational F-14s out of a pre-war total of 77. It now has only a few operational AH-1J Cobra attack helicopters out of a pre-war total of 150, and less than one-third of its pre-war total of 200 transport helicopters.

Even these totals are misleading. Many flyable Iranian aircraft lack fully operational avionics, and Iran is experiencing growing reliability and serviability problems with all its missiles and smart ordnance. As a result, the entire Iranian air force would be lucky to generate more than 65 sorties per day under surge conditions.

While Iran has flown more attack sorties against Iraq, these have tended to be limited slash and run attacks near the border. Iran also is losing most of its few air-to-air encounters. For example, it lost at least one F-4 or F-5 on the 17/18th of January under conditions which indicate the Iranian fighter had serious missile or radar problems and should not have been committed to combat.

This situation is unlikely to change whether or not Iran is getting Asian versions of the Mig-19 or Mig-21. U.S. officials cannot confirm any such delivery of the F-6 and F-7, and the sources claiming such deliveries or orders differ as to numbers and whether the fighters come from Viet Nam, the PRC, or North Korea. In any case, Iran simply is not able to absorb new types of Soviet fighters effectively, and the various Asian copies do not have avioincs or armament equivilant to the older Soviet fighters they are based upon.

As for Iraq, it has about 500 operational combat aircraft and 320 helicopters, including 25 MiG-25, 200 MiG-21 J/K/L/N, 80 MiG-23B/Mig-27, 45-60 Mirage F-1, and 40-70 Su-7/20/22. It has bought all of Egypt's Soviet bombers, and has 12 Tu-22, 8 Tu-16, and 30 Il-28. It has at least 50 Mi-24 and 70 SA-342 Gazelle attack helicopters, and about 200 transport helicopters.

Iraq is able to generate fairly high sortie rates with well armed and fully operational aircraft. It is also improving its use of its aircraft. It is, however, still an amateur air force. It is committing fighters in ones, twos, and threes. It does not perform adequate reconnaissance, targeting, or damage assessment. It is extremely cautious in commting fighter and bomber aircraft and does not press attacks home against areas heavily defended with short range air defenses. It still flies too high, launches attack sorties without proper time over target and with considerable inaccuracy. It then makes exaggerated claims.

Iraq is more successful in using helicopters, particularly in support of its ground forces in daylight. It is learning to fly low, use pop-up tactics, and to make better use of forward observers. It has not, however, made much use of heliborne mobility or of helciopters to counter attack.

Some experts speculate that the Iraqi air force has not been subjected to the purges of incompetent commanders that have occurred in the army, and that it tends to lie about its success and problems to Sadam Hussein and the Revolutionary Council. In any case, it is not showing the same improvement as the army.

Iraq has continued to make occasional Scud and Frog missile attacks on Iranian positions and towns and cities in

Khuzestan. It launched reprisal attacks on Iranian cities for the bombings in Kuwait on December 15th, and new attacks on January 17th in response to the build-up of a possible Iranian offensive. These attacks depend on luck for their success. At least one missile attack has killed 30 Iranians and wounded up to 70 others, but this depended on sheer chance. A Scud warhead hit a critical part of populated area where it produced extensive secondary damage from brick and other building material.

Iraq's 24 FROG 7 and 12 Scud B launchers lack the accuracy, warhead size, numbers, and targeting to be more than harrassment weapons. This situation is unlikely to change even if the USSR does sell Iraq SS-12 missiles, and the initial reports of such sales seem dubious.

The SS-12 (Scaleboard) does have a range of 800km versus 40-60km for the FROG-7 and 270-460Km for the Scud B/C. The SS-12 is more accurate since it is an inertially guided ballistic missile, rather than a free rocket or obsolete cruise missile. It does not have the accuracy, however, to be effective using conventional warheads. It can hit a city or area target, but can only be lethal out of sheer luck. The same, incidentally, is true of far newer Soviet missiles such as the SS-21 (120km), SS-22(900km), and SS-23(500km).

The most ominous shift in the air war has been a growing Iranian threat to the U.S. Iran stationed up to 20 of its remaining F-4s in Bandar Abbas during one period in December, 1983. It started regular P-3F Orion reconnaissance flights over U.S. forces in the Gulf and Arabian Sea in late December. It has also begun to practice suicide air attacks on combat ships. While it may be using F-4s in such training, the F-5 is more maneuverable and has a much lower radar cross section, and could be a serious threat to U.S. ships under some conditions.

Iran has also stepped up its naval activity, and its purchase of small craft it might use in small raids or covert operations against its Gulf neighbors. It is interesting to note that Iran started stealing U.S. military vehicles in the FRG during this period--possibly for using in bombing.

THE PRESSURES NOW SHAPING THE THREAT IN THE GULF

Before trying to make any predictions about the future of the fighting, it is important to note several other trends or factors that are shaping the strategic situation in the region.

The Squeeze on Iraq

In purely military terms, Iraq should have a respite until March or April. It faces further fighting on at least one front, but it has gotten at least $1 billion more aid from the Gulf states since it played its Super Etendard card this fall. Saudi Arabia and Kuwait are marketing 200,000-300,000 BPD for Iraq under a time-exchange arrangement with Kuwait's Arabian Oil Company and the Saudi government.

The U.S. pledge to keep the Gulf open has put pressure on Iran. Iraq's major lenders have allowed it to reschedule its 1983 debts in return for its payment of its 1982 debt obligations. They seem prepared to reschedule its 1984 debts if its new pipeline capacity comes on line.

There is a good prospect that Iraq can increase its crude oil exports from around 0.6-0.7 MMBD to 1.0-1.2 MMBD, once it completes the expansion of its pipeline to Ceyhan in Turkey in May or June. Iraq also should be able to sustain additional sales of about 70-77,000 BPD of fuel oil and 14,000 BPD of gas-oil to Jordan and Turkey.

At some point in late 1984 or early 1985, Iraq also can look forward to the completion of an emergency 650km link from Iraq's southern fields to the Saudi Trans-Peninsular or Petroline pipeline, which runs from Ghawar oil field to Janbu on the Red Sea. This line is now under-utilized and could give Iraq 0.3-0.5 MMBD of extra capacity and raise its total crude oil exports to around 1.8 MMBD. Iraq is also accelerating plans to build a separate 1.6 MMBD pipeline to a new port on Saudi Arabia's Red Sea

Coast, and these plans may become firm by March or April of this year.

Iraq has stockpiled single buoy moorings (SBMs) to allow it to rapidly resume shipments through the Gulf. The Iraqi oil minister has claimed Iraq now has modern SBMs present in Iraq, although he has stated that Iraq does not own the SBMs stockpiled in Bahrain. While there is virtually no prospect Iraq can use such SBMs unless Iran accepts a ceasefire, they at least reduce the time Iraq would have to take to resume exports after a settlement.

Iraq may also be able to build a major pipeline from Rafal to Aqaba using part of the Trans-Arab pipeline to Sidon. This line is obsolescent, but it has a capacity of 465,000 BPD. Only 65,000 BPD of this capacity is now used--all by Jordan's refinery at Zirka. ARAMCO has already notified the governments involved that the entire line to the Mediterranean is too old and vulnerable to be maintain, and this makes conversion of the line practical without affecting other demand. Iraq does, therefore, have reasonably good prospects of expanding its exports to over 2.0 MMBD by late 1985.

Even at 1.8 MMBD, Iraq should be able to ride out its debt crisis. Iraq's medium term debts have gone from negligible in 1982 to around $5 billion, and it has exhausted its reserves. Without added oil income and/or aid, Iraq's deficit would expand from a current level $1 billion to as much as $12 billion annually. With such oil income and aid, Iraq should be able to maintain living standards as well as pay for the war, and stop programs like campaigns for donations of gold jewelry. Iraq will not, however, be able to pay for ecopnomic development.

Iran has problems of its own. It does not have Iraq's financial problems, and the recovery of its refinery capacity to up to 700,000 BPD has ended most gas and fuel shortages. At the same time, the restoration of its oil income has not led to more than modest increases in Iran's standard of living and development activities, largely because the revolution has made effectively organization and spending impossible.

Ironically, it is Iran's trade with the West and Japan that is keeping its economy functioning and providing the imports it needs to maintain its living standards. This is reflected in the pattern of U.S. trade to Iraq and Iran.

U.S. exports to Iraq have plummeted from nearly $900 million in 1981, to around $450 million annually and are still dropping. U.S. imports from Iraq have dropped from a high of over $600 million in 1980 to under $65 million annually in 1982 and 1983.

U.S. direct exports to the U.S. have risen from $87 million in 1982 to $161 million in the first ten months of 1983. These have included some key oil equipment items. U.S. imports from Iran--over 90% of which are oil--rose to over $930 million in the first 10 months of 1983. The U.S. is now getting about 30 million barrels of oil a year, or 3.5% of its imports from Iran versus 10 million barrels or 1% of a much larger total in 1982.

Growing Iranian Hostility to the West and Its Allies

The escalation of political and military tensions between Iran and the West continues to accelerate. France and Iran have virtually severed relations, France has been forced to close a Iranian controlled Islamic Culture Center because of terrorist activities, and France threatens to become an important killing ground for Iranian activists and various Shi'ite extremists. In spite of the steady explusion of Iranian students in December and January, the French security services estimate that 150-300 trained activists still operate in France as students.

Other Iranian backed movements exist in Turkey, the FRG, the U.S., Lebanon, Bahrain, Kuwait, the UAE, and Saudi Arabia. These movements are highly ideological in character, are violently anti-secular and anti-Western, portray moderate and conservative Arabs as traitors to Islam, support violent action to the point of martyrdom, and have access to substantial stocks of arms and explosives.

It is impossible to sort through the rumors and misinformation available on an unclassified level to be sure of the scale of the Iranian training effort, support, control, and liaison with other radical and terrorist movements. Nevertheless, the Iranian effort seems certain to leave a lasting threat.

The Continuing "Two Front" War

In spite of Saudi and other Gulf efforts to get Syria to re-open Iraq's pipelines and end its hostility to Iraq, Syria has steadily tightened its relations with Iran. It is now getting about $1 billion in aid from Iran--largely in the form of oil. This compares with about $800 million in economic aid from Saudi Arabia and a total of $1-1.2 billion in total economic aid from all Arab states. The USSR seems to be providing the equivalent of at least $1.5 billion annually in military aid, and the true figure may be twice as high by the end of 1984.

Syrian support of Iran seems likely to continue in spite of the inherent hostility between Syrian Ba'athism and Khomeini's radical interpretation of Islam, and the fact it has cost Syria some $240 million in Kuwaiti aid. The other Gulf states cannot afford the risk of isolating Syria or having it unleash additional radical or terorist elements. Syria is not likely to let ideology interfere with a deal that gives it a radical Shi'ite front in Lebanon, and about 160,000 barrels per day or 7.6 million tons of crude oil annually (1 million tons free and the rest at only $25 per barrel).

The net result is that Syria is squeezing Iraq just as effectively as Iran's repeated offensives. It also has created a major arms flow from Syria to Iran which is at least partly backed by Libya.

THE PROBABLE OUTCOME OF THE IRAN-IRAQ WAR

The next year should decide the outcome of the war, although not necessarily end it. If Iraq can endure until its new pipelines come on line, it should solve its key resource problem. It also has the edge in terms of force improvements. Iran's forces are a wasting asset, and its economy does not seem capable of supporting a true mass army unless Iran should be driven to a massive one-time effort.

The issue of Iraq's internal cohesion is more delicate. There are indications that the war is wearing down the army and the people's will to continue the conflict. Sadam Hussein has at least irritated the Iraqi military by making the war into something of a personality cult, and the constant purges of the army have developed lasting resentments.

There are strong rumors of a major coup attempt in 1983, and the reasons Hussein had to replace his step brothers, and appoint a military officer head of internal security have never been convincingly explained. Some informed Arab sources indicate that all three step brothers were dismissed after a harsh family quarrel over the marriage of Hussein's daughter to an army officer the step brothers disapproved of, but the truth remains unclear.

The war is not popular. It has halted the rise in living standards, cost virtually every extended family at least one casualty, forced some families to sell their jewelry, seriously hurt Iraq's efforts at eduction, and brought a halt to development.

Iraq is a far more secular society than Iran, but it is divided between Sunni, Shi'ite, and Kurd. Iraq's population is about 14.8 million, divided into 70.9% Arab, 18.3% Kurd, 2.4% Turkic, 0.7 Assyrian, and 7.7% other. About 55% of the total population is Shi'ia, 40% is Sunni, and 5% is Christian or other.

Iran has about 43 million people, roughly 93% of which are Shi'ite, 5% are Sunni, and 2% are other. It is 63% Persian, 18%

Turkic, 13% other Iranian, 3% Kurdish, 3% Arab and Jewish, and 1% other. While both nations are diverse in composition, Iraq faces far more serious religous divisions, and faces a far more serious problem in terms of Kurdish nationalism.

The Iraqi government has negotiated an arrangement with Jalal Talabani of the Patriotic Union of Kurdistan that gives it up to 40,000 Kudish volunteers in return for a promise of increased autonomy, free elections, and higher budget allocations. Other Kurdish groups, however, are backed by Iran and the war is steadily flooding arms into Kurdish hands. Turkey is also having increasing problems with its own Kurds.

While most Shi'ites favor the government, there are hostile groups and bombing and assassination attempts continue. The potential remains for some "joining of hands" between some portion of Iraq's Shi'ites and those of Iran.

There is a serious risk that such pressures will force Sadam Hussein to strike out at Iran's oil facilities to preserve his regime regardless of outside aid and increases in Iraq's oil export capacity. Nevertheless, the most likely outcome of the war is now that the restoration of Iraq's oil income will allow it to wait out the Iranian revolution.

The combination of oil income and Western and Gulf aid and support is also preferable to the risks of any dramatic mass attack on Iran. Hussein may be misled in part by his air force, but he seems far too shrewd to have much faith in its ability to achieve major results.

Nevertheless, it seems necessary to consider three far less favorable outcomes:

Outcome One: An Iraqi Mass Air Attack On Iran That Fails

The most likely outcome of any major Iraqi attack on offensive Iran's oil export capacity is failure. The threat of such an attack gives Iraq important political, economic, and military leverage; the results of executing such an attack might be quite different.

Iraq seems to lack the naval and air power to do more than close shipping to Bandar Khomeini and temporarily interrupt tanker traffic to Kharg Island. The failure of such a last ditch effort is, however, likely to bring down Sadam Hussein and possibly the Ba'ath and Iraq's secular regime.

At best, it would mean a weak Iraq and too strong an Iran. Iran might settle for a new Ba'ath or military regime, but the end result would still be to make Iran the dominant state in the Gulf, gravely weaken Saudi Arabia politically, and put immense pressure on Bahrain, Kuwait, and the UAE to accomodate Iran.

At worst, the result could be a new Shi'ite controlled state hostile to the West and the Arab states in the region. Although it seems unlikely that Iraq's national identity can be submerged for long, this is no guarantee that a successor state would not join in an "axis" with the other Shi'ite states.

Such an outcome is likely to produce an Iraq which reneges on its debts to its neighbors and the West, which concentrates on the arms to rebuild its strength rather than trade and development, and which must take a radical position on improving its oil quota and keeping prices as high as possible.

Outcome Two: Iranian Escalation

The second outcome is Iranian escalation to an all out attack on Iraq, an attack on its Gulf neighbors, and/or an attack on U.S. forces.

It is unlikely that an all out Iranian attack on Iraq could succeed without a massive one time mobilization, and incredibly bloody three front attack in which Iran simply swamped Iraq in manpower. Such an attack would be appalling in human terms and unpredictable in result. It would at least double the current casualties on both sides, leave even more lasting hatreds , and probably eventually bring down the Khomeini regime whether or not it was successful.

An Iraqi attack on Iran might also escalate the conflict to the point where Iranian forces come into direct conflict with U.S. forces acting to protect the West's oil supplies and friends in the region. This might drive Iran to seek Soviet aid, and would certainly make any rapproachment with Khomeini's successors more difficult. It could force the U.S. to deploy air and naval defenses in the Southern Gulf for several years, and it is impossible to rule out a successful Iranian attack on a key target like Ras Tanura or one of the major desalinzation plants in the region.

As best, such an attack would bring Iraq to the point of utter exhaustion where some internal political upheaval would be almost inevitable, and involve a subtler form of Iranian attack including terrorist or commando assaults on key southern Gulf facilities--again de-salinization plants and key concentrations like Ras Tanura come to mind--and attempts to terrorize Arab leaders through kidenappings and political murder.

Outcome Three: A True Oil Crisis

Finally, one cannot rule out a true oil crisis. While Iraq does not seem to have the military technology and skills to attack Khark Island and Iran's other oil facilities successfully, and Iran would be extremely luck to do long term damage to a key crude oil export in the Southern Gulf, history has taught us that oil crises are as much a matter of behavior as supply and demand.

Even in a world recession and/or glut, and with far better reserves than in the past, it is far from clear that the West is mature enough, and prepared enough, to ride out any major interruption in Gulf supplies. It also is impossible to dismiss sheer "luck". Kharg, Ras Tanura, and other Gulf targets do not seem particularly vulnerable to the forces Iraq and Iran can deploy, but it is impossible to be certain.

Implications for U.S. Policy

There are times when optimism has to be so cautious that it is hard to distinguish from pessimism. There is a reasonable chance, however, that the Iran-Iraq War will shift from a war of attrition, which Iraq is now losing, to one which will end in exhaustion and leave a balance between two strong nationalist states in the northern Gulf.

This is the best outcome the U.S. and its friends can expect. The Iranian revolution is beyond the influence of U.S. arms. Iraq is never likely to be a close friend, but its political evolution will serve our interest if Iraq survives as a secular state committed to its own economic development, regardless of the precise nature of Iraq's regime or day-to-day policies.

This argues for quiet U.S. support of French, Southern Gulf, and other Arab efforts to support Iraq. It argues for a strong USCENTCOM and naval presence in the Gulf. It argues for every possible U.S. effort to help the Southern Gulf states build up the air and naval defenses and internal security capabilities. It argues for continued efforts to fill our Strategic Petroleum Reserves and it argues for renewed efforts to improve our cooperation with our allies in every aspect of Gulf defense and emergency planning for any interruption in our oil supplies.

If there are any areas where we could do more, I suggest they are:

First, to warn Iran that the U.S. would take limited but decisive action to destroy its air and naval capabilities to intervene in the Southern Gulf if it broadened the war--a threat which would involve comparatively limited U.S. action and also end its hope of a victory against Iraq, but make it clear the U.S. would not intervene in a way that would affect Iran's independence or internal politics.

Second, to try to develop some informal structure for collective planning and action between all the major Southern Gulf states and Western states selling arms to the region. It is not enough to sell bits and pieces in competition. We need as strong and intergrated an air and naval defense system as possible.

Third, to further encourage our friends in Europe, Japan, and the Gulf to do everything possible to ease the short term financial pressures on Iraq and to expedite the development of additional Iraqi pipeline capacity. At the same time, we should be discourage Iraq from any massive attacks on Iranian oil facilities, and try to communicate to Iran that such attacks are unlikely to produce serious long term results. We need to both reduce the probability of Iraqi escalation and the risk of any Iranian over-reaction.

Fourth, to work quietly with our allies in the West to consider emergency economic and trade sanctions against Iran if it should radically increase its military threat to Iraq or the Southern Gulf states. We do not need Iran's oil for at least several years, but Iran does need the West's capital and exports to sustain even its day-to-day economy.

Fifth, to communicate quietly to the Soviet Union that we will defend our vital interests and our friends in the Southern Gulf, but do nothing to intervene directly in Iran.

In short, we need to speak quietly but clearly, and to carry a medium sized stick.

Lessons of The Iran-Iraq War: The First Round

by Anthony H. Cordesman

Anthony H. Cordesman is a Woodrow Wilson fellow who has just completed an extensive trip to the Near East.

THE FULL RANGE OF LESSONS from the Iran-Iraq War may not be apparent for years. We still must await the lessons based on the battles that overthrow one of the two warring regimes, or force them into absolute exhaustion. Even then, these may only be the lessons of the first Iran-Iraq War, or the first Shiite-Sunni conflict.

The war is destroying the economies of both regimes. It has cut Iraq's average daily oil production from over three million barrels per day to less than 1.1 million. Last year's fighting cost Iraq at least $6- to 10-billion, and perhaps as much as $16- to 20-billion. This same fighting virtually consumed Iran's national reserves, forced it into becoming OPEC's "cut rate" oil merchant, and then to sell the crown jewels. Informed estimates of the damage to both countries' oil facilities and civilian economy all go above $100-billion.

Yet the present fighting has all the signs of being a preliminary bout. There is a growing feeling that any cease-fire or peace will be no more than the prelude to rearmament or revenge, and that hatreds are being built up throughout the Near East that will explode periodically into war even if one side does achieve "victory."

This feeling has always been clear in Iran. Although Khomeini spent much of his long exile in Iraq, he first began to call for an Islamic revolution in Iraq within months of his rise to power. The war started largely because of his efforts to overthrow Iraq's Sunni and secular rule, and his government has been unwavering in calling for the total destruction of Sunni and Baathist control of Iraq as the price for peace.

In the last six months, however, it has become equally clear in Baghdad. The Iraqi government is settling down to what it now regards as a war of attrition that must result in the destruction of either the Saddam Hussein regime or that of the Ayatollah Khomeini and any theocratic successors. Beneath the proud claim that Baghdad has little of the atmosphere of the capital of a nation at war—a claim which is true in many respects—lies a deep-seated fear that Iraq has made a terrible strategic mistake. For Iraq, the main lessons of the war are that it is fighting a revolution that shows no sign of going away, that no Iraqi military action can have much meaning until a fundamental change takes place in Iranian politics, and that the key to the Baath Party's survival is whether it can preserve the loyalty of the armed forces and Shiite majority in a prolonged conflict.

For much of the Arab world, the main lesson of the war is that Iraq's miscalculation in starting a war it could not finish will threaten their security and unity for a decade.

Iraq now pays only token attention to liberating Arabestan—which proved to have no great interest in being liberated. In contrast, it is showing a vast interest in finding a way to mobilize a nation of 13.6 million, only 40% of whom are Sunni and only 70% of whom are Arab, to fight a Shiite regime for as long as the war may take. The role of the popular militia in the war rose from 35,000 men in September 1980 to 400,000 in January 1982. Iraq is now trying to create a popular force of 2.5 million. It is beginning to strip key talent away from the civil economy for the first time.

Iraq is making sure that no soldiers stay too long at the front. It is keeping its internal security efforts to a remarkably low profile. It is allowing many of its students to serve only when school is not in session. It is borrowing heavily to avoid sacrifices in civilian living standards. Its Shiite soldiers are being told that Iran has shot many of its prisoners, and that Khomeini has declared that the key Shiite martyr, Ali, is not buried in Iraq but in Qum.

For much of the Arab world, the main lesson of the war is that Iraq's miscalculation in starting a war it could not finish will threaten their security and unity for a decade. The "pan-Arab" euphoria that followed Iraq's initial victories has turned into the grim knowledge that nothing can be worse than to make fundamental mistakes in grand strategy. Those Arab states which now support Iraq do so in an effort to contain Khomeini, and in the fear of what a radical Shiite-dominated, Iranian-Iraqi-Syrian axis would do to the Arab world.

Yet, the West can learn from the battles that already have been fought. While the most important lessons are tragically familiar, each new war serves as a new warning of how important the lessons are to Western security. At the same time, some new lessons are emerging out of the confusion which should be considered in structuring Western policy toward the Near East and developing world.

Attacking Into the Void:
The Problem of Grand Strategy

Iraq's goals in launching its September 22, 1980, attack will never be known precisely. It is clear, however, that these goals had to involve some mix of the following objectives:

- First, to secure the Baath regime from Khomeini's declared intent to overthrow it, and from his efforts at subversion.
- Second, to secure Iraq's borders from a long series of military incidents, and to claim the 200–300 square kilometers of territory near Qasr-e-Shirin and Behran which covers the main Iranian approach to Baghdad, which the Shah had promised to turn over to Iraq as part of the 1975 accord on the Shatt-al-Arab. (See map, p. 46.)
- Third, to redress the Algiers accord and to give Iraq total control over the waters of the Shatt, to demonstrate that Iraq and not Iran was the dominant power in the Gulf, and to enhance Iraq's status at the 1982 meeting of the Non-aligned Nations.
- Fourth, to destroy Iranian military power while Iran was still weakened by the purges of its armed forces and by the virtual cutoff of US supplies and support during the hostage crisis, while it was still converting from regular armed forces to Revolutionary Guards (Pasadran), and while most of the Iranian logistic and maintenance system was in chaos.
- Fifth, to create conditions which would overthrow Khomeini and lead to his replacement by a more orthodox and secular regime.
- Sixth, to conquer or "liberate" Iran's key oil province of Khuzistan and place it under Iraqi or Sunni Arab rule, and simultaneously secure Iraq's access to the Gulf and deprive Iran of the economic assets needed to recover as a major Gulf power.

- And seventh, to become so powerful that no conservative Gulf nation would risk Iraqi hostility, and that the hostile Baath Party in Syria would be forced to recognize Iraq's power and influence.

While the Iraqis have claimed in recent months that their goals included only the first three objectives, they were much less modest at the start of the war, and their statements then indicated that they had all seven objectives clearly in mind. There are strong indications that Iraq was planning to announce that a free Iranian government had been set up in Khuzistan when it "liberated" the provinces.

This interpretation of Iraq's objectives is borne out by the nature of the Iraqi attack, and by the efforts they made to catalyze a revolt in Khuzistan and gain military support from Oman and the other conservative states. Accordingly, the weight of evidence argues strongly that Iraq's ambitions greatly exceeded the capability of its grand strategy to achieve them.

Khomeini seemed determined to both export his revolution and revenge his expulsion from Iraq.

Iraq's Mistakes in Grand Strategy

Iraq had considerable provocation in launching its attack. Khomeini had done far more than talk about overthrowing a Saddam Hussein he once referred to as a "dwarf Pharaoh." He had sent "messengers" to subvert Iraq's Shiite population and sponsored assassination attempts on Iraqi officials. He and Bani Sadr had publicly appealed for an "Islamic revolution" in Iraq, had launched attacks on Iraqi border posts, and had shelled Iraqi towns near the border in early September 1980. While Iraq must bear a good part of the blame for the longstanding rivalry between the two nations, and for some of the incidents just before the war, even Iran's current supporters do not deny that it was behind most of the roughly 240 military incidents that occurred between the two countries in the year before Iraq invaded. Khomeini seemed determined to both export his revolution and revenge his expulsion from Iraq.

The Iraqis also had reason to believe Iran was weak and divided. A coup attempt had been made on Khomeini in August, the Iranian high command and officer corps had been purged, and most of Iran's minorities were becoming increasingly hostile to Khomeini. Just as Britain and the conservative monarchies of Europe hopelessly misread the French Revolution, Iraq mistook an intensely nationalist upheaval for divisions it could exploit to rapidly defeat Iran's disorganized military forces, to conquer its oil-rich province of Khuzistan, and then leave Iran militarily and economically shattered. It ignored the countless times in history that an outside invasion has united a revolution into a lethal military force.

Iraqi intelligence made things worse by reporting far more weakness and disorder than actually existed, but most Western experts writing at the time made the same mistake. They had forgotten, if they ever knew, the extraordinary military resilience that revolution after revolution has shown in modern times.

Like many of their predecessors, the Iraqis created a situation which redirected an internal civil war against the outside threat. They also acted to radicalize the Iranian revolution, and to make its extremism seem justified. Khomeini was able to point to a legitimate "foreign devil"; he and the radical clergy around him were able to make "moderates" like Bani Sadr into traitors, and to use the war to mobilize the bulk of the native Persian population against Iraq and other ethnic elements alike.

It is extremely unlikely, for example, that Khomeini could ever have been so effective in suppressing Massoud Rajavi's Mujaheddin-Khalq guerrillas—which at the start of the war had over 20,000 armed men—without the lever furnished by the Iraqi invasion. It is equally unlikely that anything else could have done as much to unite Iran on religious grounds. Iran may be only 63% Persian—with 3% Kurds, 18% Turkic, 3% Arab, 13% tribal, and 1% other —but it is 93% Shiite.

Iraq also made a fundamental miscalculation in treating Khuzistan as if it were an Arab extension of Iraq. This portion of Iran, which Iraq calls Arabestan, has about 3.5 million people. Only between 33% and 40% of this population can now be called Arab. Further, many of these "Arabs"—real or titular— now hardly speak Arabic and are Shiites loyal to the Iranian clergy.

The Iraqis did not simply set out to conquer this part of Iran. They let their ideology persuade them that this population would side with the "Arabs" and against the "Shiites," although their rationale for this seems to be almost totally one of ideological pre-conviction. While the Bani Kab tribe, which settled the area before the Reza Shah consolidated power, may have come from what became Iraq, its last independent leader—Sheikh Khazaal—had been overthrown by one of Reza Khan's generals in 1925. In the following 55 years, Iran had systematically "Persianized" Khuzistan through every means from forcible resettlement to the suppression of Arabic in the schools.

By the time pro-Arab groups like the People's Liberation Front of Al-Ahwaz arose in the mid-1950s, they had lost much of their popular base. When the Arab oil workers in the area rioted against the Khomeini government in early 1979 and early 1980, they rioted in protest against their pay and promotion prospects,. but showed no real signs of being pro-Iraq.

The Iraqis also seem to have failed to properly analyze the nature of their economic objective. They seem to have given Abadan, whose main function was to refine oil for export, and the port of Khorramshahr, far more strategic importance than they really had. There is no question that such objectives were important, but they were not critical or crippling. The revolution had already greatly reduced Iran's need for imports through its Gulf ports, and the vast majority of Iran's oil pipelines, oil fields, and oil loading facilities are east of Ahvaz. In fact, Iran's main oil loading terminals are far to the east at Kharj Island. To control Arabestan, and to economically cripple Iran, Iraq had to advance at least as far east as the key pipeline junctions east of Ahvaz and Bandar Mashar (Khomeini). Ideally, Iraq had to advance to the Zagros, or the towns and river barriers along a line drawn from Lali through Gazin and Bandar Deylam.

Iraq's ambitions greatly exceeded the capability of its grand strategy to achieve them.

Iraq never seems to have understood either the amount of territory it had to conquer, or to have firmly decided whether it wanted control of the province or the border area near the river.

Further, Iraq seems to have failed to fully analyze its own vulnerabilities. Quite aside from the risks inherent in sending a largely Shiite army, with not always popular Sunni officers, to fight a Shiite revolution, Iraq seems to have ignored its own geography and logistics. Iraq has a coastline only 58 kilometers long. Its three ports—Basra, Umm Qasr, and Al Faw—can all be interdicted by any conflict where Iraq cannot shield this narrow coast. Basra—its main port—is well within artillery range of Iran. The Shatt-al-Arab is also extremely difficult to secure. It is 136 miles long, and Basra is 47 miles up this passage from the Gulf. The river is only ¼ to ¾ of a mile wide and silts up quickly unless dredged. This made Iraq's lines of communication vulnerable to any war that closed the Shatt.

Equally important, Iraq's only major oil loading facilities on the Gulf were at Khor el Amaya and Mina al Bakr, and these were closer to the Iranian shore than Iraq. They also were highly vulnerable to Iran's navy, which most experts still felt clearly outclassed Iraq's naval forces at the time Iraq launched its attack. Iraq's only alternative economic lifelines were limited capacity pipelines through Turkey and Syria. The first was vulnerable to the Kurdish rebels, and the second was vulnerable to Syrian political hostility and the vicissitudes of the Lebanese civil war.

In fairness, however, one of the key lessons of the war should be that the Iraqi made most of their mistakes in grand strategy for reasons that could just have easily been made by any other state. Unfortunately, we share a common heritage of becoming involved in wars where we could not unite military and political means to achieve a properly defined objective.

The Iran-Iraq War is still another warning of the crucial importance of improving the US national security system to the point where it can think and operate in grand strategic terms. It demonstrates the importance of making this a major activity of the National Security Council; it demonstrates the importance of the initiatives Secretary Weinberger has taken to create a strategic planning staff; and it demonstrates why our Chairman of the Joint Chiefs of Staff has taken the steps to warn us that we lack a military staff organization that is capable of formulating and implementing what we do know about grand strategy.

The True Definition of "An Intelligence Failure": The Problem of Assessment

These failures in grand strategy involved important failures in intelligence, but they involved far more. While they provide a case study in the fundamental limits to intelligence, they have broader implications regarding the process of assessment.

Intelligence Warning vs. Warnings About Intelligence

It is obvious in retrospect that Iraq badly underestimated not only the capabilities of Iran's regular military forces, but those of its new Pasadran or Revolutionary Guards. In this sense, the war involved massive "intelligence failures."

It is possible to draw lessons from these failures, which are almost as familiar in recent military history as those regarding the inability to formulate and implement grand strategy:

- No clear methodology exists for estimating the combat effectiveness, adaptability, or will of enemy forces which have not been tried in combat. It is remarkably easy to issue estimates of such capabilities, but it is virtually impossible to support them with defendable indicators or reasons why such indicators should be valid.
- These risks increase greatly when such estimates must be made about the forces of developing nations, forces in political transition, and forces acquiring new tactics and technologies.
- They increase even further when reliable human intelligence (HUMINT) is not available in great detail, and when equally detailed intelligence is lacking on recent training, exercise, and combat performance. Order of battle intelligence, technical intelligence, and data on manning and stock levels are important, but they are valuable largely in interpreting HUMINT and readiness intelligence. They are dangerously misleading without such intelligence.
- And, these risks increase to the point of disaster when intelligence on the capability of military forces cannot be related to how they will be commanded in war and the probable political behavior of the high command.

Having said this, however, it is immediately necessary to point out that major failures in one or more of these areas are almost inevitable, and have characterized the intelligence assessments of both sides in virtually every modern war.

The real lesson of these intelligence failures is to realize that nations inevitably blunder into war half blind. The issue is not one of how intelligence can correct this situation, it is rather to realize just how specious any "intelligence" that claims special vision must inevitably be.

This lesson, incidentally, is particularly important for the United States. The only revolution our national security planners have ever understood was our own. In recent years, however, we have not even tried. Our HUMINT effort has been publicly gutted over the last decade, and long before that it was sacrificed to fund technical collection means. Yet, the United States has committed itself to create a Rapid Deployment Force (RDF) to fight in exactly the area where Iraq made such disastrous mistakes. It also has committed the bulk of its ground and air forces to fight in a NATO environment where their success and survival depend on our ability to predict their qualitative edge relative to Warsaw Pact forces and the degree to which our allies share that edge.

The Iraqi officer corps was largely Sunni, while the troops were mostly Shiite.

Introspection and Assessment

Half of the reason for this ignorance, however, comes from the problem of self-assessment, and this was at least as serious an Iraqi failure as its assessment of Iran. Even today, it is clear that Iraq fundamentally lacks the capability to honestly assess the training, readiness, and weaknesses in its own forces. It was even less able to make such assessments when the war began.

The extent of this failure becomes clearer when one compares the total military forces and resources on both sides when the war began (shown in Table One, p. 42). Seen from an Iraqi perspective, they seem relatively well matched. The ratios favor Iraq in some respects, and Iran in others, but Iraq obviously managed to build up a surprisingly large military force structure, given the difference in population and Gross National Product. Further, although such numbers disguise a general technical superiority in the equipment on the Iranian side, they make no allowance for Iranian losses of manpower and combat-ready equipment as a result of the revolution. Up to a point, it was reasonable for Iraq to assume that Iran could not commit most of its forces to battle, or take advantage of most of its technological superiority.

The Assessment of Air Power

There are, however, several aspects of the Iranian force structure that Iraq should have found of special concern, and which none of the Iraqi statements at the time or since indicate that Iraq properly considered. The first is that Iran's air force was primarily offensive. This shows up in the numbers in Table One, but it becomes even more clear when the aircraft types involved are considered. The Iranian attack aircraft included 188 F-4D/Es and 166 F-5E/Fs. The Iraqi attack aircraft included 12 TU-22s, 10 obsolete IL-28s, 80 export versions of the MiG-23BM, 40 SU-7Bs, 60 export versions of the SU-20, and 15 Hunters.

All of the Iranian attack aircraft are advanced types with high quality avionics, as well as the ability to carry advanced attack munitions. None of the Iraqi aircraft have more than mediocre avionics, and most cannot carry advanced munitions. This meant that an Iraqi victory was dependent to a very high degree on the extent the revolution made these fighters inoperable or that Iraq could destroy them or their bases.

Unclassified Western estimates made at the time of the Iraqi attack indicated that only 18-50% of the Iranian attack aircraft were operational. To this day, it is unclear what the truth was, but these figures still seem reasonable. Discussions in the Gulf also indicate that Iraq relied as much on such press estimates as on any intelligence sources. Iraq should have realized that this left Iran enough air strength to strike at Iraq's oil facilities and key economic targets—many of which have only 100-200 miles of strategic depth. It should have realized that in any prolonged war, it would face an enemy which could strike at its economic survival and reply to Iraqi victories on the ground with air power.

Iraq compounded these mistakes, however, by grossly overestimating the capabilities of its own air force. Unlike Israel, Iraq seems to have let ideology and rhetoric delude it into assuming that its air force and ground-based air defenses had high effectiveness. It did so, however, in spite of the fact that its most effective attack squadrons and all its bomber squadrons had been kept under Hussein's thumb to keep them from threatening the regime, and had had only third-rate operational training.

Iraq did so in spite of the fact that its fighter pilots had received very limited training in the USSR and no modern air-to-air training in Iraq. In fact, they were virtually untrained for combat except in one-on-one encounters at altitudes above 5,000 ft. It did so in spite of the fact that the October War had clearly demonstrated just how difficult it is to attack a sheltered or protected airbase, and that its pilots had shown relatively poor combat accuracy in strikes against the Kurds and in operational training before the war. It did so in full knowledge that it had almost no low-altitude radar coverage, complicated by serious netting and reliability problems in its medium altitude coverage. It did so in spite of all the lessons the October War provided regarding the acute performance limitations in the SA-2 and SA-3 missiles, and the fact that it had only about 25 SA-6 launchers, which were manned by half-trained crews, and which were not netted into anything approaching a capable air defense system.

Iraq did so in spite of the fact that it conducted only the most pro forma close air support exercises with the army, and that in real world terms, it was able to sustain less than 50% on-line operational readiness even in its best squadrons. And, it did so in spite of the fact that it had no real reconnaissance or target analysis capabilities, and no command and control structure suited either to carrying out close air support missions or conducting an integrated air defense.

In short, Iraq forgot an "iron law" of air power that the lessons of the two previous Arab-Israeli wars should have rammed down the throats of every senior Iraqi official and officer: you are only as good as your sustained performance in realistic exercises and combat training, and you are never likely to be better than your methods and equipment have proven in previous combat.

The key lesson that emerges from the Iraqi mistakes is exactly the one that emerges from most modern wars: air forces are defeated or weakened at least as much by their internal illusions as by the enemy. The minute that readiness data cease to be realistic; training is cut back or separated from realistic combat conditions; effectiveness is exaggerated; equipment performance and lethality are overstated; gaps in training and doctrine are ignored; and an air force becomes a bureaucracy rather than a ruthlessly self-critical fighting machine; an air force places itself in the position where it must try to carry out in war the preparation it should have carried out in peacetime.

The Assessment of Sea Power

The second critical weakness, and perhaps an excusable one for a land power, is that Iraq ignored Iran's clear naval superiority. Again, it did so in the face of accurate press reporting that while the Iranian navy had serious problems, it still was able to send its larger ships to sea, still flew its six P-3Fs armed with Harpoon, and was able to threaten not only Iraq's facilities in the eastern Gulf but tanker movements in the entire Gulf region.

Iraq also ignored the Iranian navy with the clear knowledge that its own navy was largely ineffective. In this case, Iraq's leaders knew that most of their 12 Osa Is and Osa IIs with Styx missiles had very poor readiness and operational training. They had, in fact, approached two Western European navies in 1978 and 1979 and asked for help in training and improving their readiness. They had stated quite openly that Soviet training had proven inadequate and that the missiles on their ships were not proving effective even in an environment free of electronic countermeasures.

They also should have known that much of the Iranian navy was based outside the effective range of the Iraqi air force, and that the Iranian air force could provide it with considerable air coverage. They should have realized that even if Oman and the United Arab Emirates did allow them to use their bases for a heliborne assault on the Tumbs and Abu Musas, this was quite different from acquiring the sustained air power capabilities necessary to strike at the Iranian navy in areas outside the normal range of Iraqi airbases. They should have known that the Iraqi air force had no training for striking against naval targets. Further, even if they ignored all these factors, they should have realized that no Iraqi invasion was likely to occupy Abadan Island in less than a week, and that there was a good prospect that by that time, Iranian artillery might have effectively interdicted Iraq's ports.

The Iran-Iraq War is still another warning of the crucial importance of improving the US national security system to the point where it can think and operate in grand strategic terms.

In this case, the lesson of assessment is less complex and controversial than in the case of air power. The Iraqis either launched a war without regard to sea power, or launched a war in which they had terrible vulnerabilities to sea power, with a total disregard of their own lack of effectiveness. It is a basic principle of strategy that the military balance and the outcome of war must be viewed in terms of an accurate assessment of the ability to fight the enemy's entire force.

The Assessment of Land Power

Iraq's problems in assessing its land power are more complex. Conversations with a number of senior Arab officers, who talked to Iraqi senior officers before and after the war started, indicate that Iraq seriously miscalculated the technical superiority of Iranian army equipment, and the importance of the immense stockpiles of material that the Shah had purchased. Iraq did, therefore, underestimate Iran's potential qualitative edge and the extent to which Iran could fight a long war without resupply if it needed to.

Iraq evidently also placed high reliance on the impact of the political turmoil in Iran's mobilization system to collapse, in disrupting Iran's ability to move material and men to the front, and in reports that Iran's reliance on a computerized logistic system had left it unable to find many of its holdings of parts and ammunition. Iraq almost certainly underestimated the fighting power of individual Iranian units and Iran's ability to sustain a war if it was given the chance.

This, however, was probably a relatively minor miscalculation compared to Iraq's overestimate of the capability of its own land forces. Senior Arab officers from several countries friendly to Iraq have noted that one of the consequences of the extreme politicization of the Iraqi armed forces is a heavy emphasis on morale, on nationalism and the impact of revolutionary fervor, on the impact of masses of manpower, and on highly demanding physical training.

They also note, however, that this politicization has led Iraq to ignore the weaknesses in its force structure and to underemphasize realistic training. A combination of ideology and constant political purges has also led Iraq to ignore most of the Western and Israeli commentary on Arab military weaknesses and failures, and to create a highly centralized command structure which does not tolerate honest reporting on readiness problems, success in converting to new weapons and technology, and the host of minor problems affecting military capability.

Virtually every Western military expert would confirm these judgments, and several have added the point that Iraq's limited military experience led it to seriously overestimate its capabilities. One aspect of this overestimation evidently lay in its experience in the October War. It did prove successful in moving large formations to the front very quickly and without warning, making effective use of its tank transporters. This seems to have led Iraqi planners to overestimate the mobility that Iraq could achieve advancing through Iran, while they conveniently forgot that Iraq's forces were halted dead the moment they encountered serious Israeli opposition.

Further, the long campaigns against the Kurds—which produced some 60,000 Iraqi casualties between 1968 and 1975—had led the Iraqi forces to adopt a very peculiar style of fighting. The Iraqi forces could not suppress the small Kurdish guerrilla units, so they adopted tactics based on massing against Kurdish villages, towns, and strongholds. These tactics involved massing against the objective, sealing it off, and then methodically using artillery fire and strafing to disorganize the defense. Armor and infantry would advance slowly, and be used in ways that essentially added to the bombardment.

Tanks would be dug in where they proved vulnerable. If the strong point continued to resist, more artillery would be used and tanks would continue to be used as artillery. This worked well in advancing against a half-trained and poorly equipped force that could not be resupplied effectively. Even so, however, the Kurds were only defeated after Iraq's accommodation in 1975 with the Shah led him to cut off support to the Kurds and have the CIA halt all training and supply.

In the years that followed, Iraq enshrined many of the tactics and procedures involved into its training and planning without realizing the implications. They overlaid Soviet tactical concepts regarding mass and maneuver without ever conducting realistic field exercises. This was not the way to prepare for a very different kind of war with Iran, and it was not the way to develop a realistic understanding of the capability of Iraq's forces.

Table One

Iraqi and Iranian Forces and Resources at the Beginning of the Iran-Iraq War

Category	Iran	Iraq
General		
Total Population (in millions)	38.3	13.1
GNP*	$76.1	$21.4
Defense Expenditures*	$ 4.2	$ 2.7
Arms Imports During 1974-78*	$ 8.3	$ 5.7
Total Military Manpower	240,000	242,200
Conscript Manpower	180,000	177,200
Additional Paramilitary Manpower	75,000	79,800
Army		
Armored Divisions	3	4
Mech/Inf Divisions	3	4
Mountain Divisions	0	4
Independent Brigades	4	3
Active Army Manpower	150,000	200,000
Reserve Manpower	400,000	250,000
Medium Tanks	1,735	2,750
Other AFVs and APCs	1,075	2,500
Self-Propelled Artillery	564	?
Towed Artillery	1,000+	800
Air Force		
Air Force Manpower	70,000	28,000
Total Combat Aircraft	445	332
Bombers and Attack	354	217
Air Defense	77	115
Recce	14	0
Helicopters (Army & Air Force)	746	277
Navy		
Naval Manpower	20,000	4,250
Missile Destroyers	3	0
Missile Frigates	4	0
Corvettes	4	0
Missile Patrol Boats	9	12
Large Patrol Boats	7	5
Maritime Patrol Aircraft	6	0

*In billions of dollars

Source: Adapted from the IISS, *The Military Balance, 1980/81* and ACDA, *World Military Expenditures*, 1969-78.

The Assessment of Politicization

Finally, the problem of assessment was compounded by the fact that Iraq seems to have been as unable to understand the impact of its own revolution as it was unable to understand the impact of Iran's. The Iraqi Baathists surrounding Saddam Hussein had legitimate reason to be proud of the progress they had made in uniting the country after 1978. The suppression of a military coup backed by the Iraqi Communist Party had been followed by progress in economic development and in sharing the nation's wealth, which merits considerable respect.

Similarly, the Revolutionary Council had greatly relaxed Iraq's internal security effort, and had taken a wide range of measures to win popular loyalty and ease the past tensions between Kurd, Sunni, and Shiite. It is easy to underestimate this progress in the West, but it is immediately apparent to any current visitor to Iraq who can remember it in the mid-1970s. Even some Arab opponents of the Baath and Saddam Hussein give Iraq considerable credit for this progress.

Nevertheless, Iraq's high command had been extensively purged in 1978, the key offensive forces of the Iraqi air force were kept under Hussein's personal control, and the capital was kept surrounded with politically loyal combat units under constant supervision by the security services. Iraq's T-72 tanks were kept in reserve elements specially chosen to secure the regime. The government treated honest reporting of military problems as failure or disloyalty, and it overcentralized every aspect of decision making. Iraq thus went to war against an opponent that it regarded as crippled by internal politics with crippling political weaknesses of its own.

These were compounded by the differences between the two regimes. Iran was in the grip of revolutionary, ideological, and religious fervor. It was ready to take high casualties, to defend a revolution, and was already socially and politically committed to a national state of war. In contrast, Iraq's political cohesion lay in the belief of its citizens that regardless of politics, life was getting better. Iraq's unity depended on avoiding casualties, on maintaining the rise in living standards, and on avoiding any circumstances that could lead to friction between Kurd, Sunni, and Shiite. This was particularly true because the Iraqi officer corps was largely Sunni, while the troops were mostly Shiite. This did not matter if Iraq won a quick, decisive victory, but it meant that it would be acutely restricted in what it could do in a protracted war.

Lessons for the West

There are some obvious lessons here regarding the importance of politics to war, and the need to assess relative politicization in the military forces of developing states. There is also yet another point of evidence in the thesis that most armed forces can only organize and train to win their last war, and that this usually goes a long way toward preparing them to lose the next.

The key lesson, however, is one that Andrew Marshall, the Pentagon director of Net Assessment under six Secretaries of Defense, has been trying to teach our own forces for nearly the last decade. The success of military planning depends to an extraordinary degree on an honest net assessment of the comparative strengths and weaknesses of one's own forces, those of one's allies, and those of the threat. This lesson has serious implications for our own planning, given the extent to which we politicize the problems of the all-volunteer force structure, the funding of readiness and training, the effectiveness of our weapons, and the military validity of our current tactics and training against the USSR. We too live in a climate of illusion regarding the problems in our forces and degree to which we are ready to meet Soviet forces in war. We are not Iraq, but the Soviet Union is not Iran.

The corollary of this lesson is equally apparent, and it is one of the key lessons we learned from air combat in Vietnam and that Israel learned from the October War. The key to stripping away the illusions that bind one's own military effectiveness is to conduct constant training in as realistic a manner as possible. Further, the key to readiness is not equipment strength, ammunition stocks, small-parts inventories, or manning levels: it is training and continuity.

Problems of Strategy

The problems in the strategy of the Iran-Iraq War are not solely those of Iraq. Iran virtually provoked the war, but had no defensive strategy. No lessons can be drawn from this behavior except that revolutionary societies can suddenly embroil themselves in wars that they have made no attempt to be ready to fight. However, Iran has so far done better without a strategy, than Iraq has done with one. By exploiting the weaknesses in Iraq's war plan, and by reacting to Iraq's vulnerabilities, Iran has beaten "something with nothing."

Admittedly, it is more speculative to draw conclusions about the war's strategy than about Iraq's grand strategy and the assessments it made in launching its attack. Nevertheless, some aspects of Iraq's strategy do seem clear.

The Timing of the Attack

The first is the timing of the attack. Iraq faced a relatively narrow time window in terms of weather if it was to strike in 1980. The rainy season in the area starts in November and can continue through April. Southern Khuzistan is crossed by a number of major water barriers and 640 minor ones. It is subject to flooding, and this can be enhanced by opening key dikes or dams. The central and northern fronts are subject to rain, cold weather, and snow in some areas. Iraq had to strike while the terrain was relatively dry.

Further, Iraq could not predict whether the turmoil in Iran would be reduced. It faced an Iran in near civil war, with its military purged, cut off from US parts and ammunition by the hostage crisis. The Carter Administration had publicly hinted it would resume shipments if the hostages were released, and the regular armed forces opposing Iraq were being steadily strengthened by Revolutionary Guards.

Iraq faced the problem that it had had only limited military resupply from the USSR after the coup attempt in 1978, and that its conversion to Western equipment—if it could be accomplished at all—would not come before the mid-1980s. It only got its first four Mirage F-1s, for example, in February 1981, although it had first ordered 36 of the aircraft in 1977. It was not able to operate most of its French army equipment effectively, and had not even ordered the numbers of equipment it would require.

Air forces are defeated or weakened at least as much by their internal illusions as by the enemy.

Iraq also faced several political problems. One was the need to rapidly assert its leadership of the Gulf. The second was its uncertainty regarding future US and Soviet ties to Iran, and its ability to attack a still isolated Iran when the rains ended in the spring. The third was the fact it had a second hostile Shiite-dominated power on its western border, and had no way to predict the impact which Shiite or Kurdish unrest would have if it did not attack. Finally, it was hosting the Non-aligned Nations Conference in the fall of 1982, and a victory would give Iraq immense influence.

Seen from this perspective, the timing of the Iran-Iraq War seems to be well judged, and an almost natural outcome of the forces and pressures involved. The only difficulty, and the key lesson involved, is that it took the West about a year after the war started to become aware of all these pressures.

The Strategy of the Land Attack

The nature of Iraq's strategic objectives—and its expectations regarding its ability to conquer Dezful, Ahvaz, Abadan, and Khorramshahr—is still a matter of conjecture. The rest of its land attack strategy, however, is fairly clear. Even in peacetime, Iraq faces three distinct military problems on its border with Iran. The first is that it must secure the northern part of the border to ensure security against both an Iranian invasion and problems with its Kurds. It can only reduce its concentration of forces in the area at the cost of a sharply increased risk of Kurdish insurgency.

The second is that in the central part of the border, Baghdad is only 100 miles from Iran, and while there are fairly good rough terrain and mountain barriers on the Iranian side, it is a "straight shot" at Iraq's capital from the Iranian border garrison of Qasr-e-Shirin. While it is almost impossible for Iraq to advance to Tehran and the key Persian cities in Iran, it is comparatively easy for Iran to threaten Iraq's capital, and it is unlikely that a Sunni-led government could survive the capital's fall.

The third is that any attack on Iran on the southern part of the border must reach Dezful and Ahvaz to have any chance of creating an Arabestan, securing Iran's oil industry, seizing Iran's key military bases in Khuzistan, and securing a military victory. Iraq must control Abadan island and Khorramshahr to provide minimal security to the Shatt al-Arab, and must secure Bandar Khomeini to give that security even the slightest sustained credibility. However, the size of an Iraqi advance through the south quickly becomes limited by roads and engineering equipment. It is not possible to move more than five to six divisions through the area without immense problems in creating new roads, crossing water barriers, etc.

These factors force Iraq to divide its forces to cover three fronts. The only issue is the extent to which it should try to take the offensive on all three fronts, and here certain terrain and strategic factors become critical. The first is that any advance in the north means moving through easily defendable mountains and into a void. Even a capture of Mashhad or Tabriz would present more problems to Iraq in occupying such cities than to Iran.

The general land force strategy of the war is shown in Map One. Iraq began with five divisions in the north, two guarding the central area near Baghdad, and five in the south. These included three armored divisions and two mechanized divisions. Opposed to this, Iran had four of its nine under-strength divisions along a 1,300 km frontier. One was an infantry division near Urumiyeh in the far north, the second was an infantry division at Sanandaj covering the threat from the Iranian Kurds, and reinforced by the Pasadran. The third was an armored division at Kermanshah, and a brigade at Qasr-e-Shirin. The fourth was an armored division in Ahvaz which covered the south and shielded Iran's key airbase at Dezful. A battalion group garrison was added to the town of Mehran just before the war began.[1]

Although exact details are uncertain, Iraq's strategy in dealing with this

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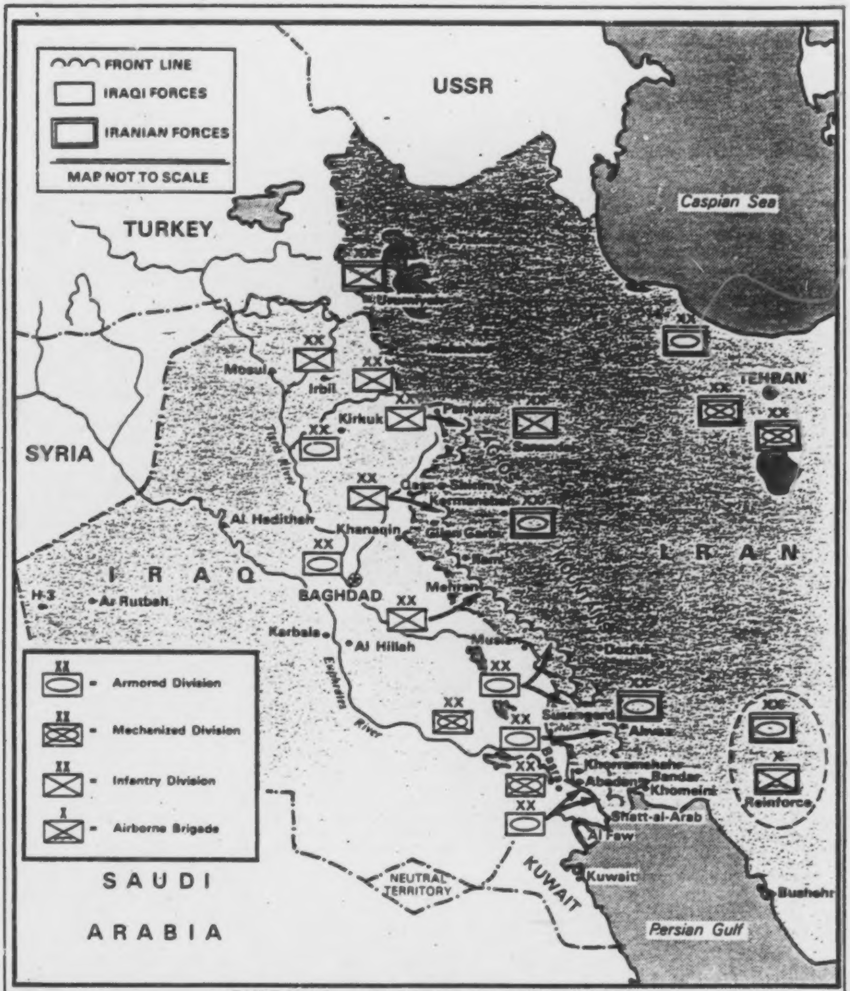
FRONT LINE
IRAQI FORCES
IRANIAN FORCES
MAP NOT TO SCALE
USSR
Caspian Sea
TURKEY
SYRIA
IRAQ
IRAN
TEHRAN
Mosul
Irbil
Kirkuk
Panjwin
Sanandaj
Qasr-e-Shirin
Kermanshah
Gilan Gharb
Al Hadithah
Khanaqin
BAGHDAD
H-3
Ar Rutbah
Karbala
Al Hillah
Euphrates River
Mehran
Musian
Dezful
Susangerd
Ahvaz
Basra
Khorramshahr
Abadan
Bandar Khomeini
Shatt-al-Arab
Al Faw
Kuwait
KUWAIT
Bushehr
Persian Gulf
NEUTRAL TERRITORY
SAUDI ARABIA
Reinforce
XX
X
= Armored Division
= Mechanized Division
= Infantry Division
= Airborne Brigade

GULF WAR – THEATER OF OPERATIONS

Col. W.O. Staudenmaier, US Army Strategic Studies Institute, from "A Strategic Analysis of the Gulf War," ***The Iran-Iraq War: Old Conflicts, New Weapons.*** **Edited by Shirin Tahir-Kheli and Shaheen Ayubi, Praeger, NY (forthcoming).**

situation was to hold defensively in the north, although an Iraqi infantry division finally attacked toward Panjwin in December in an effort to secure the oil fields at Kirkuk and link up with anti-Iranian Kurds. Depending on the source, one infantry division, and possibly an armored division as well, attacked across the central front at Qasr-e-Shirin with the goal of either pinning down the Iranian armored division at Kermanshah or destroying it. Another Iraqi infantry division advanced against Mehran, although some elements may initially have been held in reserve.

In the southern front, which would decide the success of the strategy, Iraq attacked with one armored division against Dezful and Susangerd, one armored division against Ahvaz, one armored division against Abadan, and two mechanized divisions—plus special forces and other independent brigades—in support. This gave Iraq an initial advantage of something over 5-6:1 in the southern front. In theory, it should have been decisive. Iran was not prepared for the attack, and at least during the 22nd–23rd of September was wide open to the Iraqi advance.

Iraq failed because of the grand, strategic reasons discussed earlier, because of its failures in assessment, and because of tactical failures that will be discussed shortly. However, it also failed for several strategic reasons that provide important lessons in war.

The first reason is that Iraq compounded its inability to concentrate all its forces on the most critical front by diverting a substantial portion against Abadan before it defeated the Iranian regular division at Ahvaz and captured the Iranian main airbase near Dezful. It sacrificed its most critical advantage, and the most critical moments of the war, because it failed to concentrate on defeating the enemy's military force—a basic violation of Clausewitz and virtually every writer on strategy since.

Second, Iraq was unprepared for urban warfare and warfare in built-up areas. The ability or random mixes of regular troops, rapidly reinforcing militia and reserves, Revolutionary Guards, policemen, and naval commandos to use the combination of water barriers and the cover provided by building. to halt largely unsupported and totally untrained and unprepared armor in an urban warfare environment came as a complete surprise. This became immediately apparent when the Iraqi army entered Khorramshahr. Its untrained troops waited for orders, called in artillery fire, and found that without far more independent decision-making authority than NCOs and junior officers had previously been given, they could not react in time to protect themselves.

An Iraqi special forces brigade then had to be called in, and fight its way through the city without even the advance preparation of being equipped with street maps. Like the Israelis who fought in Suez City in the final days of the October War, the Iraqis found that urban war deprives armor of its advantage, makes mass artillery fire largely ineffective against enemy forces, and gives even untrained infantry a great advantage in the defensive against partly trained attackers. At least 1,500 Iraqi died in a kind of fighting that Iraq's strategy ignored, and this led Iraq to rename Khorramshahr "Khuninshar," the city of blood.

As a defensive alliance, the West can benefit from this lesson. It reinforces the need to emphasize a NATO defense based on the use of evacuated towns and built-up facilities, and to improve NATO's equipment for urban warfare and its training for combat in built-up areas. It is also a key warning to the planners shaping the RDF. The RDF is at least as likely to die in some Gulf city as in the Zagros Mountains, and if it is to live, it should receive as much training to fight in a Gulf city as in the desert.

The Air Strategy

Iraq's air strategy was quite simple. It launched as many planes as it could for the first three days of the war. While it attacked a total of 10 Iranian airbases, it concentrated on the six Iranian airfields nearest to Iraq, and the Iranian early warning stations at Dehloran and Naft-e-Shah. It also struck at ammunition dumps and key interdiction targets.

For unknown reasons, however, Iraq attempted to deal with the problem of Iran's sheltered airbases by trying to crater runways. It either missed the large numbers of parked aircraft in the area or ignored them, and did not hit at selected soft facilities. The results were absurd. Iraq's Soviet fighters lack the kind of avionics to provide the circular error probabilities (CEPs) needed for such attacks with conventional ordnance, and Iraq had obviously neither trained for such an attack nor made any attempt to analyze how it could best be carried out. It chose a strategy in dealing with Iran's key advantage in air-attack capability that was in direct contradiction to everything written on Vietnam, the Arab-Israeli conflict, and the India-Pakistan wars about the probable lethality of such attacks.

> **The success of military planning depends to an extraordinary degree on an honest net assessment of the comparative strengths and weaknesses of one's own forces, those of one's allies, and those of the threat.**

The end result was that on the first day of the war, much of the Iraqi air force had to flee to dispersal bases in Jordan and elsewhere in the Gulf. This virtually invited Iran to attack into Iraqi territory, and it quickly discovered that formations of two to four F-4s, flying at low altitudes, were virtually immune to both Iraqi fighters and its SAM defenses. By the second day of the war, Iran hit Baghdad as well as Iraq's airbases, and after Iraq's artillery hit the refinery at Abadan on the third day, Iran began to strike at Iraq's virtually undefended oil facilities. Iraq not only failed to formulate a meaningful offensive air strategy, it failed to formulate a defensive one, and virtually dictated Iran's strategy of exploiting a key Iraqi vulnerability.

There are lessons here, but most are painfully familiar:

- First, no strategy can be implemented without tactical capability, training, and the proper technology. Successful air attacks require long preparation against exactly the kind of target mix involved; no air force in history has proved flexible in suddenly adapting general training in peacetime to effective missions in the offensive role. In spite of all the nonsense about the flexibility of air power, air forces have only been successful in implementing offensive strategies for which they received dedicated training and equipment.
- Second, air forces—and particularly those in developing countries—seem to have an infinite capacity for self-delusion about their effectiveness in offensive missions.
- Third, Western air training, avionics, munitions, and range payload capabilities are still far more effective than their Soviet counterparts, at least in the export version. This was true in Iran's case, even in the course of a revolution and when some of the pilots had to be let out of jail to fly.
- And fourth, conventional bombing of area targets may have great shock value, but the true operational CEP of such attacks is so poor—particularly when they have even minimal antiaircraft gun defenses—that it has little effect. It took the US Navy something like 66 1,000-lb. bombs to crater one gravel road just once at the start of the interdiction campaigns against the resupply routes in Vietnam. Something like a third of the Pakistani attacks on Indian airbases in the last Pakistani-Indian war were directed at nearby service roads, and missed the base, much less the runway. And so on . . .

Naval Strategy

If Iraq had a naval strategy, it has not yet become apparent what it could have been. It may or may not have hoped that the Iranian navy was incapacitated, that its patrol boats could somehow protect its oil-loading facilities, or that its air power could destroy the Iranian navy. ■☆■

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[1] Estimates of these figures differ. These numbers and many of the following figures are drawn from work done by Col. William O. Staudenmaier of the Army War College in a working paper entitled "A Strategic Analysis of the Gulf War." Other key sources include the writing of Maj. Gen. F.W.E. Fursdon in the *Daily Telegraph; Jane's Military Annual, 1981–82;* and Israeli writers in "The Persian Gulf on Fire," *The Middle East Military Survey*, Born in Battle Press, Jerusalem, Israel.

This concludes Part One of the lessons of the Iran-Iraq War. Part Two—which examines the war's lessons regarding tactics, technology, training, logistics, and resupply—will be published in a forthcoming issue.

Lessons of the Iran-Iraq War: Part Two

Tactics, Technology, and Training

by Anthony H. Cordesman

Part One of this series (Apr AFJ) discussed the lessons of the Iran-Iraq War in grand strategy, net assessment, and strategy. Part Two discusses the recent battles that have shifted the fighting in favor of Iran and the lessons of the war in tactics, technology, and training. (For reference see map, p. 72)

THE LAST THREE MONTHS have threatened to turn Iraq's attack on Iran into a political and military disaster. In March, a sweeping Iranian military victory on the central front near Shush and Dezful defeated between three and four of Iraq's 12 divisions. While Iran's lack of logistic capability and air power limited its ability to exploit this victory, it was still a severe blow to Iraq's President Saddam Hussein and its Baath Party.

In early April, Syria's tacit support of Iran became overt. In mid-April, Syria transformed its hostility to its rival Baathist regime into the equivalent of a two-front war. Syria quietly accumulated 1.5 million barrels of Iraqi oil at the Syrian terminal of Baniyas, and then seized it. Syria simultaneously announced it was ending the shipment of roughly 300.000 barrels a day of Iraqi oil through Syrian pipelines, and that it had signed a 10-year agreement with Iran to barter Syrian agricultural products and other exports for 8.7 million tons of Iranian crude oil annually (174.000 barrels per day).

Syria then closed its border with Iran, and announced that "Syria would stand beside the Iraqi people in their struggle to topple that [Saddam Hussein's] regime until they succeed." Syria followed these political and economic hostilities by providing Iran with large numbers of SA-7 missiles, which it obtained from Libya, and with roughly 90 more artillery pieces. It repeatedly sent fighters over Iraq in an effort to divert the Iraqi air force.

Further, under the cover of strengthening its security forces in the area near the junction of the Turkish-Iraqi border, Syria helped Iranian and Kurdish agents blow up Iraq's last functioning oil pipeline through Turkey and to divert its flow into the Ceyhan River. While the pipeline was flowing again within a week, even a temporary cut in Iraq's remaining oil exports cost the country $6-million a day and did nothing to help Iraq pay for a war costing over $1-billion a month, or ease its economic burdens at a time when it was already $24-billion in debt to its neighbors in the southern Gulf.

Iran gave Iraq no time to recover from its defeat in March. Iran redeployed three of the divisions it had used in its successful offensive near Dezful to the southern front. Then, on the night of April 29th/30th, Iran launched a broad attack called "Operation Jerusalem," or "Holy City," on the Iraqi positions in Khuzistan. It attacked the Iraqi positions in three main thrusts. The first was to the north along the narrow access routes to the Iraqi-held town of Hoveyzeh, about 12 miles southwest of Susangerd. The second was against the former Iranian fortress garrison of Hamid, and the only major rail and road route from Khorramshahr to Ahvaz and the Iraqi positions at Hoveyzeh. Finally, it launched a major effort to recover the city of Khorramshahr.

The attack began with widespread night infantry attacks, supported by armor. These were followed by several major armored thrusts and attacks by fighters and helicopters. During its initial days, the attack seems to have recaptured something like 309 square miles of Iranian territory, although the Iranians had serious difficulty in their northern thrust against Hoveyzeh and in advancing through the well-entrenched Iraqi positions in front of Khorramshahr.

Iraq's performance was mixed. The regular "al-Qassem" and "Usama" divisions around Hoveyzeh fought well. Iraq made better use of its defensive positions than it had around Dezful. It showed a new willingness to maneuver and listen to the advice it received from Jordanian experts. Iraq also made good use of new deliveries of French Mirage F-1 fighters and French advice, and more effective use of its air power. At the same time, the newly formed Iraqi volunteer units with three number or "triple digit" designations along the Hamid front tended to break or surrender without sufficient cause.

By the second day of the fighting, each side claimed it had inflicted some 6.000 casualties on the other. Iran claimed sweeping advances while Iraq claimed its Fourth Army had "completely crushed" the Iranian attack. Iraq seems to have been correct in claiming victory to the north, but Iran began to cut the highway that was Iraq's major line of communication south of Ahvaz, massively reinforced the positions across the Karun River.it had won in its Abadan offensive, and breeched Iraq's defensive positions around Khorramshahr. Iran made unusually heavy use of its helicopters during this attack, and seems to have captured some 2,500 Iraqi prisoners, and inflicted over 5,000 casualties, at the cost of about 2,500 Iranian casualties at the Hamid front.

Iraq counterattacked on the 3rd and the 4th, making heavy use of its own helicopters and aircraft. It seems to have recovered some of the positions it lost near Khorramshahr, and to have launched two division-sized counterattacks on the main Iranian thrust against Hoveyzeh. This thrust was constrained by terrain to a narrow line of advance, and the Iranians were repulsed with heavy losses. Iran responded by reinforcing its thrust on Hamid, and its helicopters attacked the Iraqi town of Fuka, about 200 miles south of Baghdad, in an effort to halt resupply of Iraq and to divert Iraqi forces. It also used helicopters to attack an Iraqi command post at the border town of Chalamcheh.

By the 7th of May, at least 60.000 Iranian troops and 200 tanks were on the west bank of the Karun River around Taheri and Haloub. US intelligence experts estimated that each side had lost over 15,000 men, and that some 8,000 Iraqis had been taken prisoner. Iran claimed a massive victory, although Iraqi sources claimed they were cutting off the Iranian bridgeheads, that 21.000 Iranians had been killed, and 140 Iranian tanks had been destroyed. Iraq flew up to 100 fighter sorties per day, while Iran flew nearly as many helicopter sorties.

By the 9th of May, Iran seemed to have scored a major victory. It cut the road through Hamid, which is on a raised dike and the key to defending the area. This meant the Iraqi forces could no longer be supplied, and Iraq's Usama and Mohammed al-Qassem forces had to abandon the front to Iran. Iran recaptured an additional 116 square-mile "triangle" north of Khorramshahr, and approached

positions on the Shatt within 15 miles of Iraq's port of Basra. By May 12th, Iran nearly recaptured Khuzistan. It was on the Shatt, was consolidating its position in Hamid and Hoveyzeh, and had gained an additional 366 square miles of its territory. It had recaptured the border town of Chalamcheh, 15 miles north of Khorramshahr. By the 14th of May, it threatened to cut off the Iraqi forces in a besieged Khorramshahr, and even to invade Iraq.

If Iran should win the current battle, as now seems likely, its victory seems likely to reestablish Iran as the major power in the Gulf, although scarcely as one of the West's "twin pillars." It also seems likely to increasingly threaten Saddam Hussein's survival and Takriti control of Iraq's government. The Ayatollah Khomeini and senior officials of the Iranian government have stated that they will not invade Iraq. This may be true. Such an invasion might stiffen the will of Iraqi forces and arouse nationalist support for Saddam Hussein. It would also expose Iranian armor to combat on Iraq's flat river plains, and deprive its infantry of much of the cover they have used in previous combat.

However, both Khomeini and senior officials of the Syrian government have categorically stated they seek the overthrow of the current Baath regime. If Iraq should come under pro-Iranian rule, there is a good chance this could create a belt of Shiite-ruled states extending from Lebanon to Iran. The success of the Syrian-Iranian "axis" would also give the Soviet Union a strong new incentive to back Iran and become its major arms supplier, and could link states as diverse as North Korea, South Yemen, and Libya into a radical front with a victorious Iran.

Iran's Success: the Trip from Susangerd to "Operation Victory"

One thing is already clear: Iran has recently been the "winner" in the war. The failure of the Iranian offensive at Susangerd on January 5, 1981, has been followed by a steady series of Iranian successes. In spite of its resupply problems, revolutionary turmoil, and the gradual reduction of its operational air strength to something like 70–100 fighters, Iran has forged a surprisingly effective military machine.

The Iranian Defeat at Susangerd

Iran's first major counteroffensive of the war failed for many reasons. Former President Bani Sadr committed the three understrength regular armored regiments under his control to an assault without the support of the infantry provided by the Revolutionary Guards loyal to Khomeini. He telegraphed his offensive to the extent that the Iraqis were well-positioned and waiting for him, and then attacked without combined arms support from the regular army. He ignored the fact his ground of attack was a sea of mud that critically inhibited Iranian ability to conduct logistic resupply, and he failed to maneuver when his armor entered the killing ground created by well dug-in Iraqi tanks and infantry.

As a result, the Iraqis were able to surround the Iranian forces on three sides, and to force the Iranians to abandon many of their armored vehicles because they could neither refuel nor resupply them. Several reports agree that—in spite of the fact both sides fired at ranges under 1,000 meters, and that the firing was heavy and went on for some time—most of the losses occurred because of Iranian inability to maneuver and to resupply in the mud. Iranian armor was not so much defeated as stuck and abandoned. It is also clear that Iraq showed no ability to exploit its victory and counterattack.

The Iranian Victory at Abadan

Bani Sadr's January 1981 offensive proved to be the last battle Iran was to lose between early 1981 and its May 1982 attack. Following Bani Sadr's flight from Iran, the regular armed forces and Revolutionary Guards acted in comparative unity. This unity and competent command enabled Iran to retake Abadan during September 26–29, 1981. While the full details of this battle are unclear, Iran seems to have led Iraq to redeploy its forces from the Abadan front by launching a series of minor attacks on the front north of Susangerd, along the Karkeh River, and in various parts of the Khuzistan front.

Iran then attacked with a force roughly equivalent to two infantry divisions, plus armor and artillery, along the Bahamsheer River side of Abadan Island. From all reports, the Iranian attack was well organized, and took Iraq by surprise. According to some reports, Iran made good use of night infantry attacks over a broad area to find weak spots and penetrate while pinning down the Iraqi forces in strongly held areas. Iran also seemed able to exploit its tactical successes and concentrate forces quickly and responsively, while Iraq tended to freeze in position and await orders.

Both sides seem to have fought well in head-on confrontations, but the Iraqis seem to have been fatally slow in maneuvering and in adapting to the changing circumstances of battle. While the Iranian infantry showed amazing courage and a willingness to die in frontal assaults on Iraqi positions, the Iraqis held positions too long and were then outflanked as much by their own rigidity of command as by the initiative of their enemy.

The resulting Iranian victory seems to have cost Iraq the equivalent of one trained division, and something like 600–1,500 killed, 1,500–3,000 captured, and hundreds of armored vehicles. It also seems probable that Iran lost something like 3,000 killed to achieve this victory, but still was able to rout Iraq's 10th Armored Brigade when it tried to counterattack.

The War of Lies

Iran lost four top commanders in a helicopter crash following the battle for Abadan, and in the months that followed, the war seemed to be largely a "war of lies." This was nothing new. Both sides had long exaggerated their victories and their opponent's losses.

The true losses on both sides before Iran's March 1982 offensive probably approached 70,000 killed, and 150,000–200,000 casualties. Each side had lost some 110–175 aircraft and over 700 tanks. The war had also created roughly two million new refugees.

In the period between the Iranian victory at Abadan and Iran's spring offensive, these differing "victory" claims led to considerable confusion.

The fighting around Bustan and Qasr-e-Shirin in December 1981 and January 1982 led to particularly contradictory reports. One of the most common interpretations of the war was that Iraq was not able to hold its positions because of its unwillingness to take casualties.

There is no doubt that Iraqi officials encouraged this interpretation. However, Iraq's tactics were much the same that it used in the Kurdish war—although on a much grander scale—and it is far from clear that Iraq could have taken any more of its objectives if it had been willing to take more casualties. In general, Iraq proved far less flexible and able to maneuver than Iran, less able to use air power, show initiative, and exploit opportunity.

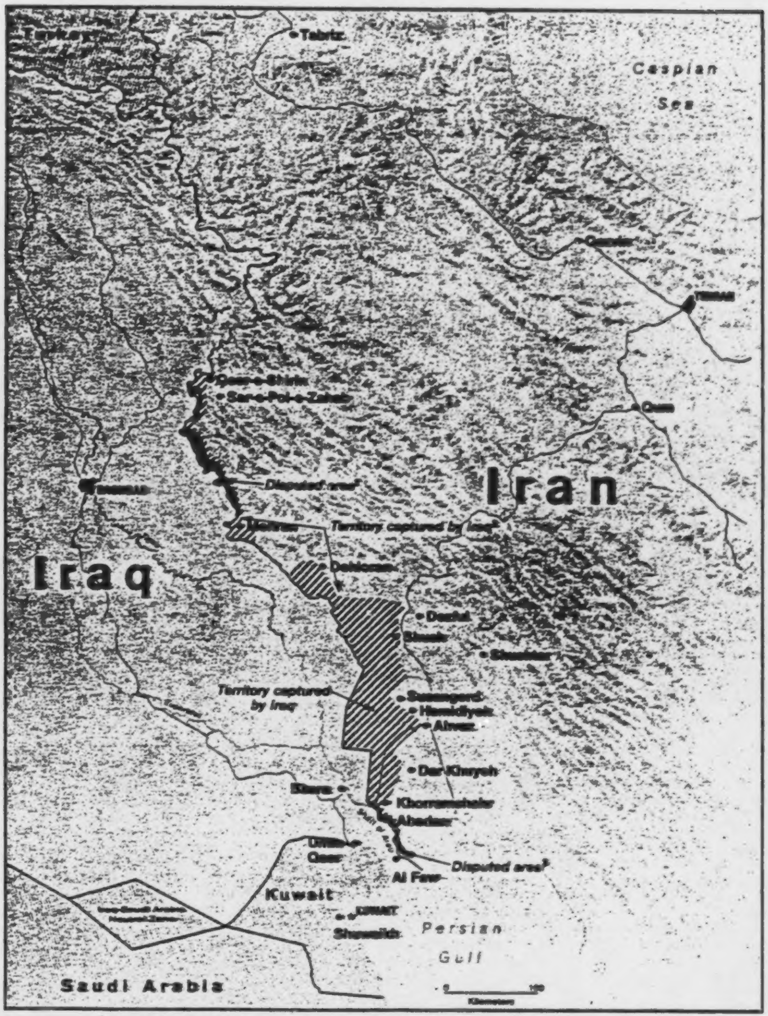
Iran's Operation "Undeniable Victory"

Iran proved this during February and March 1982. It kept its newly won confidence and initiative in spite of the loss of its top commanders. It systematically built up its forces for a spring offensive near Dezful, and repulsed repeated "spoiling attacks" by Iraq's fourth army, which were designed to disrupt the buildup of the Iranian attack. In fact, Iran inflicted serious losses on Iraqi attackers during these spoiling attacks, and forced them to dig in even further.

In the third week of March 1982, Iran launched its offensive in the Dezful-Shush area. It built up a force of more than 100,000 soldiers, including some 30,000 Revolutionary Guards, plus additional volunteers and logistic elements from a new popular force called the "Army of 20 Million." This gave it the equivalent of four divisions, including an armored division redeployed from the Pakistani frontier. The Iraqis had also built up their forces to three divisions, plus eight independent brigades, with the Iraqi 10th Armored Division in reserve.

Iran, however, was able to deploy one

Key Fighting Areas in the Iran-Iraq War


Turkey
Tabriz
Caspian Sea
Tehran
Qom
Iran
Qasr-e-Shirin
Sar-e-Pol-e-Zahab
Disputed area¹
Baghdad
Iraq
Mehran
Territory captured by Iraq²
Dehloran
Dezful
Shush
Shushtar
Territory captured by Iraq
Susangerd
Hamidiyeh
Ahvaz
Dar Khuyeh
Basra
Khorramshahr
Abadan
Shatt al Arab
Umm Qasr
Disputed area³
Al Faw
Kuwait
KUWAIT
Shuwaikh
Persian Gulf
Saudi Arabia
0
100
Kilometers

[1] "Disputed Area" is area Iran ceded to Iraq under the 1975 Algiers Accord, but did not turn over.

[2] Shows maximum line of advance.

[3] Claimed by Iraq, but ceded to Iran under Algiers Accord.

armed forces JOURNAL international/June 1982

more division than the Iraqis had detected. On the night of March 22nd, the Iranians waited until roughly 3:00 am. and then launched a two-pronged attack from the north and the east. The initial attack made excellent use of large numbers of small infantry units carefully trained to attack a given position. While some reports indicate that religious "commissars" had whipped the forces into a frenzy, and that they carried paper guaranteeing them admission to paradise as "martyrs," Iranian forces were not employed suicidally and they had excellent command. This attack caught the Iraqis by surprise in two ways. First, they were not prepared for a late-night attack, and second, they were not prepared for an attack from the north or for the weight of another Iranian division.

Between the 23rd and the 28th of March, Iran launched waves of carefully staged infantry attacks that kept Iraqi forces pinned down in place. At the same time, it pushed two reorganized "armored divisions" forward in an enveloping movement around two Iraqi divisions which had dug in deeply on the front. In spite of press reports to the contrary, both sides fought heavily during the initial phases of the battle; but while the Iranians had some trouble in pressing forward, they again were able to maneuver and exploit their opportunities, while the Iraqis delayed.

The Iranians were able to outflank at least two Iraqi divisions. Iranian units also virtually destroyed the 10th Iraqi Armored Division when attempting to check it. The resulting Iraqi losses included the 11th Special Mission Brigade, the 96th Infantry Brigade, the 60th Armored Brigade, and other independent elements.

The Iranians conducted their offensive virtually without fighter air power. While Iraq flew over 150 sorties per day, including some with its new Mirage F-1s, the Iranians kept most of their 70–90 remaining operational fighters on the ground. The Iranians used some F-5s, but relied on attack helicopters for most close air support. They also relied on curtain fire from their automatic weapons, antiaircraft guns, and SA-7 fire to keep the Iraqi fighters from pressing home their attacks. This enabled Iranian troops to absorb the rest of Iraq's badly delivered air strikes and occasional use of attack helicopters.

News films of the fighting show that the Iranians did a far better job of exploiting terrain and maneuvering in detail. The Iranians made excellent use of the hilly terrain in the area, both defensively and in finding good terrain upon which to maneuver their armor. Far too often, the Iraqis maneuvered too late and lost the terrain advantage, bogged down in the mud, or were enveloped in company and battalion-sized elements and forced to surrender.

It is impossible to tell how much a loss of morale contributed to the willingness of Iraqi troops to surrender or abandon their armor, but it is clear that Iraq lost at least 320 tanks and armored vehicles and that the Iranians captured 350 more. Western observers estimate that Iraq suffered at least 10,000 casualties. As many as 15,000 Iraqis seem to have been captured, and Iranian casualties do not seem to have exceeded 10,000, with only 3,500–4,000 killed, although as many as 6,000 Iranians may have been taken prisoner. The stress the fighting placed on Iraqi military capabilities is indicated by the fact that even before this battle, Iraq thrust foreign workers and children into the front. These included Egyptian peasants and farmers who were specifically promised exemption from the fighting.

Iranian battle communiques issued on April 3rd claimed that victories were being consolidated in the Ein Kosh (Duflak) region and Neshad west of Dezful, and that Iranians were pursuing the enemy at Saleh Abad, Sunar, Gilan-e-Gahreb, and Pol-e-Sar-e-Zahab. (Iraqi and Western reports use other names.) It is clear, however, that Iran pushed Iraq 24–28 miles nearer the border, and threatened Iraqi positions along a 200-square-mile area just north of Bustan, and west of Dezful. The Iranians also definitely recaptured 700–800 square miles of territory, and moved within five–10 miles of the Iraqi border.

Tactics, Training, and Technology: The Lessons of the Fighting

The risks of drawing premature lessons are all too familiar from the Arab-Israeli October 1973 War and previous conflicts. Wars are so complex that they must initially be studied much as the blind men studied the elephant, and with the same problems in providing an accurate picture of the beast. There is, however, agreement in enough areas so that it can at least be said that blind men "see" alike. Subject to this important caveat, the following lessons have so far emerged regarding tactics, training, and technology:

Armor and the Dominance of the Defensive

Some of the key tactical lessons of the war grow out of the strategic failures discussed in April's *Journal*. Iraq consistently failed to concentrate its armor in the initial stages of the war and consistently lost the advantages of time and space. It scattered its armored forces in the initial attack on the central front into elements the size of reinforced battalions and failed to concentrate them on advancing on Ahvaz, Dezful, or Susangerd.

Regardless of the recent Soviet emphasis on "daring thrusts," Iraqi armored units have followed the most rigid Soviet tactics of the World War II era. They continuously halted after their first tactical successes. According to one source, they actually occupied Susangerd on the 23rd of October, 1980, and then withdrew in confusion. According to others, they entered and abandoned Susangerd twice, and gave up critical positions near Dezful, because they lacked clear orders and responsive command. According to all sources, they failed to concentrate against Dezful and Ahvaz and to occupy these towns or aggressively attack them while their defenses were still weak.

Iraq compounded this tactical mistake by sending armor to attack defended and built-up positions without infantry support. This had the inevitable result that neither Iraq's superiority in armor nor artillery could be exploited, and Iraq took major losses every time its armor encountered infantry forces defending in built-up areas or using terrain barriers.

The course of the war has also again validated the advantage of defensive positions against attacking forces that lack proper training, motivation, and maneuver capability. Both sides have generally been able to halt superior enemy forces, and inflict greatly superior casualties, whenever they have been on the defensive. Position and terrain have also been critical, as has the ability to exploit prepared positions; although the Iranians have generally shown more skill both in using such positions and in attacking them than Iraq.

The Iranians have made good use of built-up areas, water barriers, and rough terrain since the first days of the war. They halted the Iraqis just outside Qasr-e-Shirin by using the rough terrain in the area. They delayed the Iraqi advance on Abadan by using water barriers and the built-up areas on Abadan Island, and often halted the Iraqis elsewhere in the field by digging in their tanks and infantry at points where the terrain was favorable. Deliberate flooding also was used to channel the Iraqis into a few routes of advance in low-lying areas in the south, and to force them into a massive engineering effort.

The Iraqis have proved almost as effective in using defensive positions against the Iranians. The Iraqi problem does not seem to be one of exploiting defensive positions, but rather of the inability to reinforce and redeploy once such positions are penetrated or flanked.

Iraq's newly raised "double or triple digit" units, with their largely political leadership, have tended to collapse under such pressure: its over-rigid and slow-reacting command structure and relatively poor training in maneuver have prevented Iraq from using reserves effectively and to reacting to changes on the battlefield. At the same time, both sides have shown that they are still amateur armies.

and just how difficult it is to create a force that can maneuver effectively with modern armor.

Reliable reports from both sides indicate that they are still not able to use their tank gun sights and fire controls with more than minimal effectiveness, and that their tank forces go to battle by closing to 200–300 yards or "bore-sight" range. This brings them well within range of the defenders' dug-in tanks and infantry antitank weapons. Iran's superiority over Iraq does not imply that the former can necessarily make effective use of its armor by Western standards.

Both sides have tended to dig in to reduce the vulnerability of their tanks, rather than maneuver. The Iraqi tanks advancing on Abadan moved in grindingly slow phases, where tanks would provide cover while Japanese-made bulldozers and digging equipment carved out hull-down, defilade emplacement positions. As news films of the advance show, during the initial fighting, Iraqi armor advanced in this manner half a kilometer at a time, and then only after artillery would pound possible Iranian positions.

According to one report, this led to a desperate Iraqi request to France early in the war to ship bulldozers for its tanks so they could dig in faster. It has consistently led to Iraqi tanks digging in so well that they could not dig out, and their being outflanked and outmaneuvered by Iranian infantry.

The Iraqi "farms" of Iranian tanks that Iraq captured during the first half of the war show that Iran abandoned tanks with no damage because of an Iranian inability to resupply them or deal with minor repair problems. Reports from the Iranian side confirm that this has been equally true of the Iraqi tanks that Iran has captured in the fighting around Abadan and near Dezful.

Abandoning armor intact is characteristic of poorly trained and commanded armies. Armor should not be kept dug in so long that it cannot maneuver or retreat; it should not be exposed where it cannot be refueled or supplied with ammunition; and it should not be left in positions where it becomes enveloped in enemy armor to the point where it is safer to leave the tank and run.

At the same time, due credit should be given to the Iranians' ability to learn. The Iranian army has been purged twice and most of the officers from lieutenant colonel up, who were the officers most closely associated with Iran's US advisors, have left the armed forces or no longer have key positions. It is the younger officers, in their mid-30s or younger, who now lead the Iranian forces. While many did have US training, many more have been forged on the anvil of battle.

In contrast, the Iraqis only now seem to be heeding the advice they have had from Jordan and France. However, there is one aspect of Iraq's use of armor that may be of importance to the West. If Iraq has not maneuvered well on the battlefield, it has tended to maneuver well behind it. It has made extensive use of tank transporters and lighter AFV transporters to quickly wheel its armor from one front or battlefield to another.

These moves are conducted without the use of column formations, and by what seem to be civilian drivers. They allow movement of 150 tanks or more, plus additional large numbers of AFVs on lighter transports, to occur far faster and with far less vulnerability to air attack, than the ponderous formations common in NATO, and at speeds of up to 40 miles an hour. This greatly reduces maintenance problems and fatigue, since the tank crew can rest while the armor moves. It may not be the ideal alternative to the M-1, but it is much cheaper and could serve NATO's existing tank inventory.

Uncombined Arms

Most observers agree that both sides showed a consistent inability to use combined arms effectively until Iran united its forces following Bani Sadr's flight into exile. Iraq sent tanks with minimal infantry support into built-up areas early in the war, and promptly saw its armor killed by infantry. Iran evidently sent its tanks into combat against Iraq in largely unsupported and head-on maneuvers in its Susangerd offensive of January 5, 1981.

Even in the recent Iranian offensive, the artillery on both sides was used largely in area fire against a position occupied by the enemy, or to blast at dug-in enemy positions during times when armor is advancing or digging in. Counterbattery fire has proved slow and mechanical. Only a few attacks, which involved long preparation, showed much attention to shifting and massing fires to support maneuver. As a result, the artillery fire—which both sides have emphasized so much—has been most effective against area targets. Tanks have been both sides' most effective short-range artillery.

The Infantry: Courage as Usual

Infantry on both sides have usually proved to be dedicated and combat effective even when they have had minimal formal training. Although both sides have had desertions and some large-scale surrenders, their infantry have generally shown that they will fight with great courage even when they do not receive proper support from armor and combined arms.

It was only after the formation of volunteer units, which were usually led by senior members of the Baath rather than professional officers, that Iraqi infantry began to surrender or collapse without being defeated in detail. These units, which normally have two to three number designations, often have low grade manpower with very limited training. They have permitted many of the Iranian breakthroughs since early 1981, and been the source of many of Iran's prisoners.

This has important implications for the West, since the Rapid Deployment Force (RDF) may encounter similar resistance in any built-up area or rough terrain, and both sides have shown that once their troops know the area, their ability to take advantage of position makes up for formal training in tactics and weaponry. Any effort to commit US troops without regard to the defensive fighting characteristics of local forces—many of which would be at least as likely to oppose US troops as to regard them as liberators—could result in a military disaster.

The Importance of Independence and Initiative

Iraq has taught an important lesson in command and infantry tactics. At the start of the war, it controlled NCOs and junior officers so rigidly that they would not move without orders, waiting rather than taking the initiative. They were particularly unwilling to advance without orders or to maneuver around a position once ordered to advance. This cost Iraq many casualties in the first few weeks of fighting in Khorramshahr and Abadan. It became apparent to the Iraqis that initiative must begin at the NCO level, and that even small squad-sized formations must have considerable independence in warfare in built-up areas.

Iraq has since improved the freedom given to small formations, junior officers, and NCOs. It also reacted to combat stress by rotating combat elements in and out of the forward areas at intervals as short as three days in the period before Iranian pressure locked Iraqi troops into their forward positions. Unfortunately for Iraq, however, it obviously did not succeed in giving its commanders enough freedom of action.

Training Combat in Urban and Built-Up Areas

The Iran-Iraq War also illustrates the need for special training to fight in urban and built-up areas, and for special tactics in avoiding the problems raised by such areas. A recent analysis by writer Edgar O'Ballance[1] indicates that Iraq initially attacked Khorramshahr by ferrying three armored regiments across the Shatt-al-Arab to north of the city. It then sent

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[1] In addition to the sources listed in the Part One in April's *Journal*, this article draws on the work of Edgar O'Ballance, "The Iran-Iraq War," *The Marine Corps Gazette*, February 1982; various articles of Drew Middleton in the *New York Times*; reports from the *Washington Post* and *New York Times* correspondents in Iran; and conversations with various attaches and experts from the region.

unsupported armored forces forward into an urban area where they were petrol bombed and destroyed at short ranges.

Iraq only took the city by virtually halting offensive operations for three weeks, while giving special training to units from its special forces, paratroop units, and Presidential Guards. Even then, it took a total of 15 days and some 5,000 casualties.

When Iraq went on to attack Abadan Island, its forces were channeled into a few narrow approaches using captured bridges and one additional pontoon bridge. The Iranians were able to fight a prolonged defense in detail, using natural and man-made barriers and resupplying by boat and helicopter. In contrast, Iraq concentrated on trying to force the island into submission with mass artillery fire and conventional tactics. It failed to coordinate naval and army operations, and continued to concentrate on Abadan, although its tactical and strategic importance was minor compared to key objectives like Ahvaz.

It is essential that the RDF train to fight in such warfare, and that the US avoid the kind of street fighting that would lock even the best-trained US forces into fighting their way through a city step by step. Even if the US had the time and force ratios to win such a combat, it would be even less able than Iraq to accept the political consequences of the resulting casualties.

Special Forces and Mountain Units

The value of the Near East's equivalent of special forces showed up in the pipeline sabotage that cut Iraqi oil shipments through Turkey on September 26, 1980, and in a far more spectacular series of incidents on January 4–6, 1982. On the 4th, saboteurs cut the Tripoli spur of Iraq's pipelines through Syria just 10 days after it opened and started shipping 200,000 barrels per day, or half the line's capacity. Other saboteurs cut the pipeline through Turkey some 68 kilometers from the Turkish border, a 750,000 barrels per day (BPD) line which was running at 80% capacity. This temporarily reduced Iraqi shipments from around one million BPD to 300,000, or less than a tenth of Iraq's prewar level of 3.7 million. A fourth incident of sabotage in Lebanon temporarily cut Iraq's oil exports just before Iran's March offensive. As has been mentioned earlier, a fifth cut Iraq's pipeline through Turkey just before the start of Iran's May offensive.

Given Syrian and Lebanese Shiite hostility to Iraq, and the ability of Kurdish rebels to operate in Turkey with growing Iranian support, the seriousness of these two attacks was far greater than the temporary halt in oil flow might indicate. Iraq received a not-so-subtle notice that all its oil shipments may be cut at any time.

In contrast, it should be noted that Iraq's mountain divisions have shown the value of special training for mountain warfare in attacking Qasr-e-Shirin and Mehran, and that mountain troops can conduct flanking movements with a speed in mountain terrain that other forces cannot. This again may have important lessons for the RDF, which seems to have had more desert training than in mountain warfare, and which may now have to meet both Russian forces trained in the mountains in Afghanistan and local Iranian or Iraqi forces with extensive experience in mountain combat.

The Use of Reserves

It is also possible to draw some important conclusions about the potential value of reserves, particularly in the defensive role. One of the key factors that enabled Iran to hold in the early days of the war was the use of reserves. Reserves allowed Iran to rapidly build up from a 6:1 local inferiority, when the Iraqi attack began, to no more than a 3:1 inferiority by mid-October. Reserves (or popular mobilization to be more exact) have since allowed Iran to match the Iraqi build-up.

Although it was generally discounted at the time, Khomeini's call to move 125,000 men to the front by any possible means in mid-September 1980—after the first serious artillery duels and border incidents—reflected a realistic estimate of the number of volunteers available. Civil and military transport did move up to 100,000 men into the area by the time the full-scale Iraqi invasion started on September 22nd. Iran seems to have been able to get as many as 200,000 men to the front by late November 1980, and has been building up its forces in the region ever since. Iran may now have only six to seven regular divisions committed to the front, but it has something like five additional divisions worth of manpower mobilized into Guard and other irregular elements.

It is not surprising that such "untrained" Revolutionary Guards have often been highly effective. Many are trained ex-soldiers, and in the early days of the fighting, the sheer chaos of their organization forced them to act independently, thrust them into situations where they took high casualties but learned how to fight, and taught them to improvise their supplies. This gave the Guards an advantage over Iraq's overcentralized forces, and time to learn. If the West German territorials can do half as well, they may be a far more effective defensive force than most NATO experts have thought, and the Iranian experience indicates that the Dutch, Danish, and Norwegian light reserves may also have significant military value.

Certainly, one country has already taken this lesson to heart. Iraq began the war using only 35,000 men of its popular militia. By February 1982, Iraq was using 400,000, and was trying to mobilize a full-scale "people's army," and a "task force of 2.5 million." It also was seeking to recruit other Arab militia or volunteers, and not simply for political solidarity purposes. King Hussein of Jordan's call for a volunteer Yarmouk brigade on January 28, 1982, reflected quite serious Iraqi fears that the Iranian ability to draw on members of its organized reserves, other ex-military and conscripts, and volunteers was proving decisive in allowing Iran to mass enough infantry to win tactical engagements in spite of much heavier casualties.

At the same time, Iraq seems to have focused so much attention on mass and morale, that it has failed to pay realistic attention to tactics and technical factors. Even in January 1982, interviews with senior Iraqis indicated that they did not understand many of the true reasons for their reverses in the field, or realize the shortcomings in their tactics, command, training, and communications. They allowed themselves to believe in the myths of their own ideology, and insisted that their commanders and intelligence officers be believers as well. In war, being able to hear bad news quickly and honestly is just as important as being able to hear good news.

Combat Engineering and Engineering Support

One of the areas where both sides have proved relatively efficient is in combat engineering and engineering support. Iraq started building oil-mixed black-top, hard-surfaced, two-lane roads to the front on the second day of the war. It used such roads to support its positions before Dezful, Ahvaz, and Khorramshahr when the rainy season began and to successfully foil Iran's attempts at flooding. This proved particularly critical in allowing Iraqi forces to continue to operate near Ahvaz in spite of Iran's use of irrigation dams to flood part of the area.

Iraq and Iran have been using construction equipment to strengthen lines of communication ever since. Construction equipment has also been used to rapidly build defense positions and extensive use has been made of shelters, earth mounds, and excavation. Urban and built-up positions have been rapidly shored under fire using shovels and dozers. Artillery and air attacks on roads and runways have been repaired within hours.

It is also interesting to note that Iraq's greatest tactical successes of the war occurred as a result of the ability of its combat engineers to rapidly cross water barriers for the first time in Iraq's military history. For example, the rapid construction of a 310-meter pontoon bridge on October 10, 1980, enabled Iraq's Saladin division to carry out an excellent night

crossing operation about 10 miles up the Karun (Qum) River from Khorramshahr. This operation resulted in the capture of the 50 M-60 tanks turned over to Jordan, several 175mm guns, large numbers of stocks, and extensive numbers of Iranian prisoners. It also enabled Iraq to threaten the Abadan-Ahvaz road and cut Iran's western pipeline net.

Iraq's engineering was also good enough to support pontoon and barge operations across river barriers with tidal changes of 1.5 meters and considerable currents. This proved critical in assaulting Abadan Island on October 24, 1980, when Iraq was able to capture only one of the two existing bridges to the island.

Combat engineering and the extensive military use of civil construction equipment can be expected to be an important feature of any future war in the Gulf. It is obvious that both sides in the current war have learned to make combat engineering a critical aspect of their defensive tactics, and the rest of the region places so heavy an emphasis on its construction industry that it can be expected to follow suit.

The Importance of Long-Range Artillery

Both sides have been successful in using long-range artillery in attacking cities, ports, and oil facilities. Iranian artillery, some firing from shelters built under the Shah, proved critical in halting the Iraqi advance on Dezful and Ahvaz. It was Iraqi artillery, not air power, which destroyed the refinery at Abadan—and the artillery on both sides which closed the Shatt and provided support fire in the campaign to take Khorramshahr and in the fighting over Abadan Island.

At the same time, however, far too much fire has had little more than a harassing character; it has once again become clear than both military operations and even day-to-day civilian life can go on even under intense bombardment once troops and civilians become used to the shock effect of artillery rounds. To be effective, artillery must be maneuvered as much as armor, used as quickly and surgically as possible, and then switched to new targets.

Still, the disruptive effect of the 175mm and 130mm guns firing sporadically into urban centers and rear areas has had an importance out of any proportion to their lethality. The disruptive effect of artillery has proved to be much more important than its shock effect, and both sides have clearly found every kilometer of range to be of great value in reaching such targets.

The Iraqis have complained, however, about the Soviet failure to provide suitable fire-control equipment and the doctrine and computers to manage mass artillery fire. They have also found they lacked suitable communications gear, and the doctrine and training to use forward controllers to call in artillery fire in support of armor while under maneuver. Officers in friendly Arab states are uncertain as to whether this is the result of faulty Soviet advice and equipment or of Iraqi planning, but note that the USSR did not provide effective advice and support equipment to Egypt.

Close Air Support and Helicopter Forces

Close air support has often been conspicuous by its absence since the early days of the war. Both sides, particularly Iraq, have tended to use fighters only in key attacks and in emergencies and when the survival of their ground units was in question. The Iraqis have charged that part of the reason for this is that many of their Soviet-made bombs and rockets are duds. However, they have also showed they have had little meaningful training in the attack role—except in strafing and rocket attacks—before they sought French and Jordanian help, and little ability to coordinate air support when it could be most effective.

Retired officers among the press correspondents who traveled with Iraqi forces early in the war saw mostly missed opportunities and random air attacks. The Iranians did better early in the war, although they did not face much of a problem in deciding where and when to use close air support as long as Iraq was driving forward along every major line of advance. Iranian air support was effective in helping to halt the Iraqi advance on Dezful and Ahvaz on the 28th of September, and may have been critical in helping to halt the Iraqi push on central Khuzistan on the 1st of October. Iran also seems to have had an almost accidental success in hitting Iraqi armor while it was massing on October 3rd.

Even so, Iran's success consisted largely of the shock effect of air power on Iraqi formations, which were not yet accustomed to using their antiaircraft (AA) guns, and placed too much reliance on missiles. The Iranians did not inflict significant damage to Iraqi forces, and their main impact was in hitting carelessly deployed ammunition and fuel. Iran also failed to successfully attack critical targets like bridges, or other small fixed targets, in flying its close air-support missions.

Neither side pressed its air support missions home between the initial attack and the beginning of "Operation Victory," but the new offensives of 1982 forced both sides to use their air power. Iran has still shown considerable restraint—it now seems to have less than 100 operational fighters, but Iraq is again flying up to 150 sorties per day and has shown an increasing ability to make effective use of its Mirage F-1s since January 1982. Even so, most attack sorties have not been highly effective. The armies on both sides have learned to use man-portable surface-to-air missiles, their automatic weapons, and AA guns to do a good job of discouraging the few attacks that occur when a major offensive is not underway. This, and their emphasis on dug-in positions, has sharply reduced their vulnerability to air power.

Again, there is a message for the RDF. As was the case in the October War, the reconnaissance and air strike "cycle" must be structured to catch land forces while they are massing and moving, not once they have reached their combat positions. This means night air attacks, armed patrol, and very fast recce processing and reaction. Even under these conditions, however, Western air power must be prepared for mass gun and man-portable SAM fire. The problem is not likely to be an electronic warfare duel against sophisticated missiles like the SA-6, but mass fire of a kind that is much harder to suppress or avoid while flying attack missions on alert combat units.

Both sides have demonstrated their ability to use helicopters successfully as gunships, troop carriers, and emergency supply transports in isolated cases. There seems to be a general consensus that helicopters are survivable, and able to play a critical role in making up for the lack of proper planning, maneuver, and support in emergencies. Iranian helicopters proved both survivable and of great tactical importance in limiting the Iraqi advance around Mehran. They were critical to the Iranian supply of Abadan during the Iraqi siege, and Iran has increasingly substituted helicopters for fighter close air support since the start of its March 1982 offensive.

The Iraqis found helicopters critical in moving across water barriers, and in small tactical troop movements around terrain barriers. So few helicopters have been operational, however, that they have not been proven in the offensive role in large numbers. If they had, it seems likely that they would often have been critical in bypassing the slow-moving and dug-in defenses on both sides. As in Afghanistan, it also has been possible to use helicopters to seek out and kill targets that jet fighters cannot find, and to operate in mountainous and built-up terrain where helicopters can locate and maneuver around light AA guns and man-portable missiles that fighters cannot spot and thus overfly. This indicates that a properly structured RDF could take advantage of the maneuver problems of the armies in the region by maximizing the use of attack helicopters and heliborne forces. There is little prospect of such a force, however, unless the Congress funds an advanced attack and scout helicopter. Without such weapons, and without a suitably restructured light division with the right light armored vehicle, it seems highly doubtful that either US Army or Marine Corps forces

will be able to face experienced Iranian or Iraqi troops, or Soviet forces with Hind attack helicopters and the experience gained in the war in Afghanistan.

Air Defense

Neither side has shown much proficiency in air defense. The Iranians discovered early in the war that low-flying, small formations could strike virtually at will anywhere in Iraq. There also are many reports, often by retired Western military, that Iranian aircraft could easily defeat Iraqi surface-to-air missiles by following the maneuvers the US developed in Vietnam.

As happened in the October War, the SA-2 and SA-3 missiles have proved important largely as a deterrent to medium- and high-altitude strikes, and seem particularly vulnerable to such maneuvers at low altitudes because of their comparatively slow initial acceleration. While Iraq seems to have had more success with the SA-6, and deployed limited numbers into forward positions, the numbers have evidently been lacking to provide more than limited point coverage. There also is no doubt that the Iraqis—all public claims to the contrary—are deeply unhappy about the quality of the air defense radars and C^3I systems they have bought from the USSR.

The Iraqi investment in such Soviet systems has been immense. The Iraqis have about 70 batteries of surface-to-air missiles, although comparatively few SA-6s—which seem to be the only effective system they have. They also have bought large numbers of Soviet-built radars and associated C^3I systems. They have found, however, that Soviet training methods and doctrine are poor, that the operational reliability of their missiles and guidance equipment is low, and that the missiles are optimized against targets flying at higher altitudes than the Iranian fighters have had to operate in.

While Iraqi readiness, education levels, and training are also suspect, the fact remains that the Iraqis have been forced to rely on earth mounds, other passive defenses such as barrage balloons, and AA guns to protect their cities, oil facilities, industries, and other rear installations.

The Iranians seem to have had serious trouble in operating or maintaining their Hawk, Rapier, and Tigercat surface-to-air missiles. Although Hawk proved more effective than Soviet systems in the October 1973 War, there are no reports that Iran has been able to make effective use of such air defense systems. Like the Iraqis, the Iranians have had to rely on their AA guns and the use of "curtain fire" from automatic weapons.

It is the SA-7 and AA gun, in fact, which have emerged as the chief air defense weapons of the war. As was the case in the October War, since the hype over fighter cover and more advanced surface-to-air missiles died down, it has become clear that it is-SHORAD (short-range air defense) systems which are the key to active air defense even in rear areas. Few pilots press forward attacks on positions and facilities protected by large numbers of AA guns: this seems particularly true when radar-guided guns like the ZSU-23-4 are available.

There is a broad consensus that neither side has been particularly effective in air-to-air combat. In spite of the fact that both sides now claim to have destroyed more than 100% of their opponent's air force, most of the air-to-air combat seen by outside observers or on radars in Kuwait, Bahrain, and Qatar has been inconclusive. Engagements that should take less than two minutes have lasted as long as 20.

One senior Arab military officer, who had been consulted on Iraq's problems, said that he found the Soviet training course given to Iraq's pilots had been far too short and very undemanding, and was often further curtailed because of weather. His private reaction was that neither the training in the USSR, nor the advice on training in Iraq served the Iraqis well and that they had made things worse by cutting back further on their training effort to conserve aircraft during transition to new aircraft types.

The Iranians have similar maintenance problems. Only 10 of Iran's 77 F-14s seem flyable, and none seems able to fire missiles. The F-14s have been used as mini-AWACS, and they have been flown in the rear behind Iranian air strikes or intercepts and used to vector Iranian F-4s and F-5s against Iraqi fighters or to warn them of attempted Iraqi intercepts. Some reports have indicated that they have been highly effective in this role, although the reliability of such reports is rather uncertain.

In most air-to-air combat, the successful pursuer evidently cannot keep his opponent from breaking off and escaping, which may reflect the fact that combat tends to spiral down to altitudes where neither side is trained to fight and where the IR missiles now held by both sides are relatively ineffective. However, the Iranians have the tactical edge and the fuel and endurance to "win" most such encounters. They also seem to have a distinct edge in training, although one observer of air combat between the two sides is reported to have commented: "They can fly, but either they can't shoot or they can't aim."

As for air-combat tactics, most reports agree that virtually all the flying done since the first few days of the war has been in formations of twos and fours, and that only Iran seems to have been able to consistently hold formation tactics in air-to-air combat. No attempt has been made to use mass as a tactic for defending or countering the defense—saturation of the contested air space is one of the few Arab tactics Israeli experts fear because it degrades the effectiveness of formations and presents firing opportunities to less capable pilots.

There are several lessons which emerge from this situation. The first is that, at least to date, the USSR has done a miserable job of training and equipping developing nations with SAM and fighter defenses. The few air forces that have had any success with Soviet equipment—Egypt and India—have had this success largely because they rejected Soviet tactics and bought outside technical advice and supporting equipment. It is, of course, impossible to know just how much different Soviet training and equipment is in its "export" version, but it is clear that numbers can be largely discounted when a developing nation relies on Soviet equipment and advice.

The second is that developing nations have almost as serious a problem in learning how to operate as air forces, as they do in learning how to operate and maintain individual aircraft. Sheer numbers of aircraft tell little about military behavior when nations lack the overall command and control structure, and tactical and strategic planning capability, to operate their aircraft as part of a coherent concept of operations.

And, the third is that US air power is likely to have an importance out of any proportion to its numbers precisely because it can operate as a force, rather than as scattered small groups of aircraft. While the various combat conditions of the Middle East may not favor the American soldier or marine because of the problems of terrain, the problems of fighting among at least partly hostile populations, and the difficulty of dealing with combat in built-up areas, they do favor American air power.

Interdiction and Strategic Bombing

Both sides have proved largely unable to use air power effectively in interdiction or other attack missions in support of their military forces behind the front lines.

While some successful Iraqi attacks have been conducted in support of major offensives or to deter Iranian advances or strikes on facilities in Iraq, the Iraqis have generally failed to achieve any significant damage after their attacks on exposed ammunition and fuel dumps in the early days of the war.

The Iranian air force has been marginally better, but numerous observers confirm the fact that the Iraqi army operated with almost total indifference to the risk of Iranian air attacks against any-

(continued on p. 83)

thing other than large, fixed area targets during virtually all of the winter of 1981–82. This may have been because Iran was conserving aircraft, but this is unclear.

Neither side has shown much capability to hit medium-sized interdiction targets like bridges, or to attack even large daytime movements of armor unsupported by any air defense. This again confirms the general lesson that developing nations' air crews find it difficult, if not impossible, to efficiently execute attack missions (unless directly supported by a Western air force) and that regardless of their performance on test ranges, they can be largely ignored in a "real" war.

Strategic bombing is another story. Iraq's attempt to suppress the Iranian air force in the first two days of the war was an absolute disaster. Although it attacked 10 Iranian airfields and air facilities, it did virtually no damage. In fact, it did not even achieve sufficient shock value to impose more than the most minor delays in Iranian air force operations. While Iraq has since charged that the cause was defective Soviet-made bombs, the fact remains that Iran was able to hit at least two Iraqi airfields on the first day of combat, and with sufficient shock effect to force mass dispersals to Jordan and other Gulf countries that Iraq had not planned on when the war began.

A few Arab experts, however, explain Iraq's forced dispersal of its aircraft as the result of the fact it had comparatively few main operating bases, that most were near Iran, and that while they were sheltered, most bases had large numbers of "soft" facilities. They feel it was the asymmetries in basing posture, rather than Iran's superior effectiveness, that forced Iraq to disperse.

While Iraq did prove effective against targets like Iran's refineries and easily targetable unsheltered ammunition dumps—which forced fuel and ammunition rationing early in the war—the Iranians generally had the edge. This occurred in part because the key Iranian oil facilities in the Gulf were at Kharj island, which is only barely within range of Iraq's fighter bombers, and which Iraq proved unable to attack at key points of vulnerability. Iraq proved barely able to hit such targets as oil storage tanks, but Iran proved able to strike at smaller critical equipment targets.

While the evidence is contradictory, informed Western and Arab observers agree on the following points relating to this superiority:

- First, Iranian proficiency and accuracy in delivering conventional attack ordnance like rockets and bombs was far greater than that of Iraq, and owes a great deal to the fact that something like 100 US-trained Iranian pilots were freed from jail in the first days of the war.
- Second, Iranian missions were much better planned and indicated far better use of maps and recce capabilities and pilot briefings.
- Third, Iran did make effective use of the Maverick on at least some occasions, including strikes on Basra.
- Fourth, the superior range/payload of most Iranian fighter bombers proved absolutely critical against area targets. Iran's ability to deliver two to three times as many bombs or rockets per plane, per sortie made up for much of the Iranian air force's lack of accuracy in using such munitions, and had telling effect on dispersed targets like refineries, tank farms, and petrochemical plants.

This Iranian success may pose a particularly important lesson regarding the character of future wars because of the Iranian ability to strike at complexes like Ras Tanura (with its disastrously overconcentrated mix of oil and liquid-gas facilities) or other central oil facilities in the Gulf. While none of the air strikes on either side indicated that they could attack small key targets like the sensitive equipment involved in refineries and oil extraction, Iran's potential ability to deliver a large number of individual rockets and bombs presents a serious problem. If Iran can get the parts to make and keep its remaining F-5s and F-4s operational, it will pose a threat to Western oil supplies, and the independence of action of the southern Gulf countries.

At the same time, the actual damage done by such air strikes should not be exaggerated. Discussions with some of the Iraqi experts involved, and confirmed by Arab, Western, and Japanese observers, indicate that air power had a much greater effect in forcing both nations to shut down operations than in doing actual physical damage. The psychological impact of burning oil tanks and petrochemical plants tends to disguise the fact that most of the key equipment emerges intact, and that the key military result is to force a temporary shutdown of operations.

Iran must, however, be given credit for some relatively accurate and well-planned attacks on Iraqi power plants, and for demonstrating considerable coordination in several attacks. This coordination was particularly striking in an attack launched on Iraq's H-3 oil-field complex and airbase at al-Walid, where Saddam Hussein keeps his TU-22 and IL-28 bombers. This target is over 800 kilometers from the nearest Iranian airbase at Reza'iyeh, and work done by Col. W. O. Staudenmaier of the Army War College indicates that Iran's F-4s had to refuel to carry out this attack. Other reports have since indicated that Iran retains a significant refueling and long-range strike capability.

Iran also showed considerable skill in planning its three air attacks on Kuwait. Its "accidental" bombings of Kuwait on 12 and 16 November, 1980, hit at border

suddenly be transformed by a clear Soviet commitment to Iran, or by an unexpectedly successful Iraqi counterattack. Khomeini could die or Saddam Hussein be assassinated. An Arab-Israeli war over Lebanon could even realign all the players.

The present fighting may, in fact, look simple compared to the broader wars to come. Iran's increasingly vicious attacks on Saudi Arabia, and the widening conflict between Sunni and Shiite may transform Arab and Islamic politics, and a true Soviet-Iranian rapprochement would cripple the present security position of the US and conservative Gulf states. The "logic of arms" also indicates that a new arms race will follow even the most successful "peace," and force the rest of the Arab world and Israel to follow. Ironically, this could even trigger an oil glut and lower oil prices as both Iran and Iraq desperately strive to get the revenues to both rearm and placate their populations.

The US and Saudi Arabia seem reasonably well postured to deal with this situation. Saudi Arabia is acquiring the air defenses it needs to maintain its own defense against currently foreseeable threats, and can count on US support in the interim to deal with any radical buildup in the air or naval threat against it. Contrary to some press reports, Secretary Caspar Weinberger's visit to Saudi Arabia resulted in mutual compromises which will fully implement the constraints on the E-3A that President Reagan pledged to Congress, but which, however, give Saudi Arabia a much stronger say in the overall mix of air-defense systems to be delivered, and in cooperative training and planning.

If there is any critical weakness in the efforts the southern Gulf states are making, it lies in the failure of the smaller Gulf states to complete their letters of offer for the key surface-to-air missile systems needed to extend the Saudi air defense system into a collective air defense system, in their failure to expedite the purchase of suitable sensor and communications gear, and in the slow pace of the Gulf Cooperation Council's efforts in planning an integrated air defense system.

While its current efforts to seek help from Pakistan and Egypt may help deal with minor coup attempts of the kind that took place in Bahrain in December 1981, the real threat is now in more direct forms of Iranian military action. It would be tragic if Kuwait, Bahrain, Qatar, and the United Arab Emirates do not realize this in time. And, if Iraq is not successful in blunting the Iranian attack launched in late April, there may not be all that much time left. ■✦■

Anthony H. Cordesman is a defense consultant who has recently completed an extensive trip to the Near East.

The Iraq-Iran War: Attrition Now, Chaos Later

by Anthony H. Cordesman

(UP photo)

Other crises have blunted the West's attention to the Iran-Iraq War: Israel's invasion of Lebanon, the nuclear debate, the world recession, and a host of other issues have pushed the Iran-Iraq conflict out of the media. Just a few weeks ago, in fact, the new Secretary of Energy was telling Congress about the diminished importance of the Persian Gulf. Unfortunately, the Iran-Iraq War continues to be a critical threat to Western interests. It has become a grim war of attrition—but one that must end in a major new crisis in the Gulf—and a growing threat to the West's oil supplies.

The Shift to a War of Attrition

Last spring, Iran seemed to be on the edge of a major victory. It had thrown Iraq out of most of its strategic positions in the south, had inflicted massive casualties and losses, and had virtually halted Iraq's oil exports. Although Iran's initial offensives bogged down, the war seemed likely to end in either a successful invasion or Sadam Hussein's overthrow.

By July, however, the war had taken on a different pattern. Iran seemed to have lost the ability to operate most of its fighters and helicopters and much of its armor. It no longer was able to keep its major combat equipment operating with the supplies available on the world market, and had become heavily dependent on the light Soviet-made weaponry it could get through Libya, Syria, and North Korea.

Its F-4Es presented a particular problem because they had extremely high maintenance requirements, and Iran's only supplier of key parts, Israel, no longer feared an Iraqi victory enough to provide significant support to an Iran that had begun to ruthlessly persecute Iranian Jews. Israel also did not wish to further complicate the problems in its relations with the US that had arisen out of the fighting in Lebanon.

At the same time, Iran faced a number of problems within its armed forces. First, the high command seems to have divided with the clerics surrounding Khomeini over the feasibility of invading Iraq without greater logistic capabilities and more supplies than Iran had available. The clerics won the debate, but this seems to have placed much of the planning of Iran's offensives under religious control, and the clerics placed a strong emphasis on religious and revolutionary fervor. There were also at least minor purges within the Iranian military.

In any case, the pattern of Iranian command and tactics changed. Large numbers of infantry and poorly prepared troops began to be committed to "human wave" offensives without adequate tactical planning, heavy weapons and air support, or logistic backup.

The Failure of the Summer Offensives

By early August 1982, Iran had launched three major drives into Iraq directed at cutting off Basra, and all had failed. The first major attack occurred on July 13th and drove six to 10 miles into Iraq. It led to at least one major Iraqi ambush of Iranian forces, however, and was checked with heavy losses. Iran attacked again on the 21st, penetrating nearly five miles into Iraq, but again lacked the tactical control, armor and air power, and logistic support to penetrate successfully and was thrown back.

Iran launched equally unsuccessful probing assaults during the rest of the week of July 20th, and then launched a third major assault on July 28th. This attack accomplished nothing except to expend the lives of large numbers of infantry, many of whom were poorly trained teenagers rather than seasoned Revolutionary Guards.

These offensives raised the total cost of the war to at least 80,000 killed, 200,000 wounded, and 45,000 captured; some estimates went as high as 27,000 killed during the four offensives alone. They gained Iran a narrow strip of Iranian territory about one to two miles deep and 10 miles long in a swampy area north of Basra that was strategically worthless. In strategic terms, the offensives demonstrated that Iran could not sustain an attack into Iraq without better leadership, equipment, and logistics. At the tactical level, they also showed that the Iraqi forces would fight much more determinedly for their own territory than that of Iran and that there was no strong Shiite "fifth column" within the armed forces.

A Pause to Regroup and Subvert

Iran responded by stepping up its efforts to subvert the Shiites in Iraq and the Gulf and its attacks on Saudi Arabia. It also called for an Islamic oil embargo against the US and stepped up its executions of various Marxist and Kurdish groups and members of the People's Mujahideen.

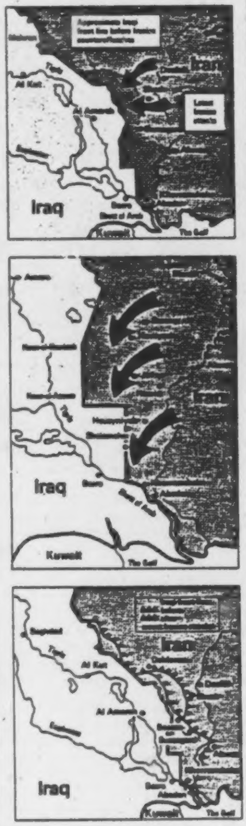
At the same time, Iran showed increasing confusion regarding its war aims. Hojatolislam Hashemi Rafsanjani, the Speaker of the Majlis, insisted that Iran had "advanced as much as it planned." Moshen Rezai, a Revolutionary Guards commander, stated that Iran would be "forced to remove the Iraqi Baath party and put an end to its crimes." Ali Akbar Velayati, the Foreign Minister, stated that it was Iraq that must "annihilate" the Sadam Hussein regime.

Iraq responded with still further consolidations of Sadam Hussein's regime, appeals to the southern Gulf states for more aid, appeals for more rapid arms deliveries, occasional charges that the US and Soviet Union were prolonging the war, and a concerted effort to dig in and establish strong defensive positions. While Iraq continued to publicize atrocity stories charging that Iran was killing untrained boys, it also desperately sought volunteers from other Arab states, including the Sudan, and committed many teenagers of its own.

Kuwait and Algeria made continuing—if unsuccessful—peace efforts. While Iran occasionally suggested that it was interested in peace, it never clarified its position on whether to accept Sadam Hussein's survival, and it fluctuated between demanding $150-billion in war reparations from Iraq and saying it might accept $30- to $50-billion from the southern Gulf states instead.

Table One

Iran-Iraq: Iran Recovers Khuzestan



The Fall 1982 Iranian Offensives

The next Iranian offensive came on September 30th. Iranian forces launched an attack against Baghdad. They drove against Mandali, south of the main Iraqi defenses at the border town of Qasr-e-shirin. This offensive involved between 50,000 and 100,000 troops and led to some of the bloodiest fighting of the war. While Iran lacked the armor and air power to punch through the Iraqi defenses and repeated its rather careless use of human wave tactics, both sides sustained significant casualties. The fighting did not die down quickly: Iran launched another major attack on Mandali on October 10th, and according to one Western estimate, the cost of a single engagement was 4,000 Iranians killed vs. 300 Iraqis.

By this time, both sides were severely hurt. Libya and Syria were supplying arms to Iran in large quantities, and Syria refused to allow Iraq to resume its oil shipments through Syria. Iraq was left with a limited pipeline through Turkey averaging only 600,000–700,000 barrels per day. Sadam Hussein had to make an emergency appeal for $3½-billion in additional funds from his southern Gulf neighbors.

Although Iraq's physical losses were much less severe than Iran's, and the war was gradually turning its volunteers into seasoned and more professional troops, Iraq was still sustaining serious casualties while paying more than $1-billion a month in direct military costs. It also was consuming much of the equipment it could get from the USSR as soon as it was delivered.

Iran had lost many of its seasoned troops and Revolutionary Guards, and many of its brigades had only two out of three battalions left. The losses among the Guards were particularly heavy because they lacked the professionalism to time their mass infantry assaults properly; they proved far easier to ambush than regular forces. Iran had virtually no operational fighters; its one remaining armored division was short of spare parts; and even its transport aircraft were so inoperable that its airborne division had to be committed piecemeal as infantry.

The War of Attrition

The result was clearly a war of attrition. Iraq had the advantage in terms of a defensive position and a far superior supply of equipment, but Iran had the advantage in terms of a rising oil income and a greater political ability to sustain casualties. Iraq tried to counter this situation by first threatening, and then conducting, air attacks on tankers and facilities at Kharg Island and by launching

Scud missiles at cities in Iran.

Iraq launched a barrage of Scud missiles against Dezful later in October, killing 21 and wounding 107, and launched repeated air raids. The result, however, was little more than harassment and irritation. The Iraqi attacks could not kill enough Iranians to have any serious military effect, and Iraq's MiG and Mirage fighters lacked the range, accuracy, and stand-off munitions capability to inflict serious damage on the well-defended facilities at Kharg.

Iran's Winter 1982 Offensives

Iran, in turn, launched a new offensive against Iraq on November 2, 1982. The offensive was launched through the foothills of the Zagros mountains and struck near Fakah (Fuqa) in Iraq. Its ultimate objective may have been the Iraqi provincial capital at Mishan, although it is unclear how Iran could have hoped to advance this far, given the lack of roads in the area.

In any case, Iranian infantry supported by M-60 and Chieftain tanks about 800 yards, to the rear, attacked at night to minimize the impact of Iraqi air power and artillery. It scored some minor successes. Iran recaptured a small oil field at Bayat and came within artillery range of some of the main roads linking Basra and Baghdad. It also secured Iranian territory around Dehloran and scored some additional minor successes. Although the Iranians had four regular and up to 12 Guard and volunteer brigades in the area, roughly three 10,000-man Revolutionary Guard brigades led the attack, and they performed considerably better than the Guard units had at Mandali.

Iraq lost several hundred killed and several thousand prisoners, about 160 to 240 square miles of captured Iranian territory, the small Iraqi town of Tib, and the surrounding heights. Iraq also had to draw on its last reserves—by then reduced to two understrength brigades in the Kirkuk-Mosul oil field in the north and an army formation south of Baghdad—to reinforce its defensive positions.

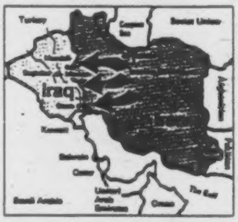
Although Iraq was able to use its growing fighter and helicopter force without opposition from the Iranian air force, Iranian units were able to down a significant number of Iraqi planes using antiaircraft guns and SA-7 missiles. This deprived Iraq of much of the advantage it should have gained from local air superiority. Nevertheless, Iraqi armor, artillery, fighters, and helicopters halted the exploitation phase of the attack, contained the limited tactical breakthroughs, and inflicted significant casualties of their own.

This offensive brought Iranian forces to new positions within shelling range of Basra but did not achieve any major strategic effect except to weaken Kuwait's and the United Arab Emirates' (UAE) willingness to provide new funds and other support to Iraq. Iraq also retained an important edge in equipment. While estimates differ, Iraq had about 3,000 operational tanks to 800–900 for Iran, 2,500 other armored fighting vehicles to 1,500, and 1,800 heavy artillery pieces to about 900. Iraq was also able to operate over 300 first line fighters to fewer than 50 F-4s and F-5s for Iran, many of which had to be kept in reserve.

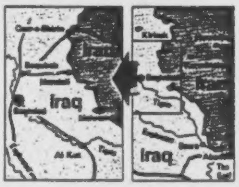
Table Two

Iran-Iraq: Iran's Offensives of 1982

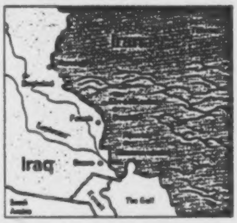
The Main Thrusts



The Drive on Baghdad in September-October



The Scene of the November Offensive



The offensive ended in what was becoming a familiar pattern. More internal tension developed in Iran and Iraq. Iraq made new appeals for aid and for help in achieving a peace. Iran issued new threats and demands for reparations and Sadam Hussein's departure. At the same time, both sides compounded their tactical problems. The Iranians suffered further attrition of the equipment needed to sustain an attack and lost more experienced military personnel.

The Iraqis remained locked in static defense positions and tactics. They lacked the organization and leadership to use reserves for any counteroffensive—if indeed they had the strength and political will to do so. This, and their inability to use air power effectively, meant that they could not exploit their ability to halt an Iranian offensive, to inflict decisive casualties, or to regain key territory.

Growing Economic and Political Pressure on Iraq

Iraq tried to deal with this situation by striking at Iran's oil exports. These exports had restored Iran's economy, given it the money to pay for the war, and were making Iran a major power in OPEC—at least among the nations pressing Saudi Arabia and the southern Gulf states to cut production so as to maintain high oil prices for the other exporting states.

Iraq launched a new series of air raids against key oil facilities, strong points, and ships in the Gulf. Unfortunately, the Iraqi pilots still lacked the range, munitions, and training to achieve much lethality, particularly against a heavily defended target like Kharg Island, with its growing antiaircraft and surface-to-air missile defenses and buried or sheltered and redundant equipment.

As had been the case with the Israeli air force in the October War, the Iraqis could not fly successful missions with regular ordnance against extremely dense low-altitude air defenses. Not only did observers note that some Iraqi pilots dumped their munitions offshore rather than try to penetrate, other sources indicated that Iraq had obtained Egyptian pilots in an effort to increase its lethality.

This situation led to still more peace initiatives in late December 1982, with Kuwait and Algeria again taking the lead. Rumors indicated that the southern Gulf nations increased their offer to Iran from $25- to $50-billion, but Iran continued to demand $150-billion.

At the same time, Iraq continued its air attacks and Iran its border raids. Iran issued a "last demand" that Iraq accept its terms on December 21st, and Iraq responded with a near-record 74-sortie attack on December 26th. While Iraq continued to occupy some 9,650 square miles of Iranian soil, the positions were of little strategic value.

By January 1983, both sides remained locked in the same positions and had the same strengths and weaknesses. Iraq remained on the defensive, using its tanks more as pillboxes than as armor. It concentrated on building up static defense lines.

Iraq's use of attack helicopters seems to have had considerable effect. It apparently compensated for Iraq's incompetence in using armored forces for defensive maneuvers rather than positional warfare and in using reserves to counterattack decisively.

Iran continued to grind away at Iraq, increasingly using Soviet bloc equipment imported through North Korea, Syria, and Libya. Although Iran could no longer operate most of its aircraft and Cobra helicopters, it did rebuild its Revolutionary Guard forces to over 200,000 men. While Iraq had the advantage in equipment supply, Iran had the advantage in expendable manpower.

This allowed Iran to launch another offensive on February 6th, called "Operation Before Dawn." The attack involved nearly 100,000 to 150,000 troops on each side and a front 20 to 40 miles wide, and was along an axis north of Dezful and Shush, west of Fakeh, and towards Al Amarah in Iraq. The attack was timed to be won on the fifth anniversary of the day that the Shah's last Prime Minister, Shapur Bakhtiar, resigned; the Speaker of the Majlis, Hojatolislam Hashemi Rafsanjani, described it as "the final military operation that will determine the final destiny of the region."

The main force involved six Iranian divisions and hit about 80 miles north of the axis of the November 1982 offensive. It was not only one of the largest offensives of the war but clearly intended to be decisive. The Iraqis captured battle plans showing that it had the objective of reaching Al Amarah and cutting the main route from Basra to Baghdad.

Iran did recover some minor border posts, took the border villages of Sableh, Safariyeh, and Rushaidah, and recovered roughly 120 square miles of territory. Iran was unable, however, to score a major breakthrough. It was forced to give up about 20 square miles of the territory it gained and suffered heavy casualties, including as many as 6,000 killed.

The terrain Iran chose contributed to the problem. While a degree of tactical surprise may have been achieved because it was an unlikely area, it was also an extraordinarily difficult area to fight in. The Iranian forces had to attack three heavily fortified Iraqi lines dug in the sand and earth among territory ranging from low hills to the edge of the marshes between the Doveyrich River and the Tigris and Tib River marshes forming a rough semicircle from Al Amarah from north to east to south. As a result, the Iranians had to attack across the wetlands or attack Iraqi positions on ridges and low hills across a relatively open plain.

Iraq again had virtual air supremacy; it was able to fly up to 200 fighter sorties a day, with increasing effect as Iraqi pilots learned to fly at low altitudes and improve their accuracy. Iraq's use of attack helicopters seems to have had considerable effect. It apparently compensated for Iraq's incompetence in using armored forces for defensive maneuvers rather than positional warfare and in using reserves to counterattack decisively.

The end result was that Iran could not sustain a penetration against heavily defended Iraqi positions, and Iraq could not exploit its defense to inflict the kind of damage necessary to destroy or weaken the Iranian army. For all its "final" character, the offensive signaled that the war could continue until one side broke politically or economically rather than militarily. Iraq also continued to control some 350 square miles of Iranian territory, largely in the Naft e-Shahr oil field area.

The Consequences of the War of Attrition for Iran and Iraq

There is no way to predict at this point how the war will end politically. Both Sadam Hussein and the Khomeini regime face significant internal security threats. While most groups that oppose them are far better at talking than acting, Kurdish rebel groups are active in both countries, and their impact in Iraq is increasing. Repeated assassination attempts have been made on both the leaders of the Iraqi Baath and Khomeini officials.

Both societies and economies also hurt. At least 300,000 have been killed, and no village in either country is now without its dead. Iran has recovered much of its oil revenue, but its domestic economy is still crippled, there is widespread unemployment, and rationing and black market operations dominate day-to-day economic behavior. Uncounted thousands of Iranians have been executed, and up to two million—including many with important technical and professional skills—have found some way to leave the country. The Khomeini regime still faces armed Marxist rebels, and it has divided into two major factions that are struggling for control once Khomeini passes from the scene.

Iraq seems to have gotten only about half the $6.5-billion in Arab aid it was promised in the last six months of 1982 and faces a massive budget deficit even if it gets its aid request for 1983—highly unlikely in view of declining oil revenues elsewhere in the Gulf. It has had to make "austerity" its slogan rather than "guns and butter" and has had to cut immediate domestic spending by 20–25%. The war has shattered Iraq's development and educational efforts and saddled it with a massive debt. Iraq has spent something like $10-billion on Soviet arms since 1980, and perhaps $25-billion more on arms and supplies from the West. It is now deeply indebted to its Gulf neighbors and dependent on Egypt for arms.

Saudi Arabia and Kuwait have given Iraq 350,000 barrels of oil a day to market, and Saudi Arabia has given Iraq the right to build a 1.5 MMBD pipeline through Saudi Arabia and will finance its $2- to $3-billion construction cost. Such a pipeline to the Red Sea will bypass both Syria and the Kurdish saboteurs who have occasionally blown up Iraq's remaining pipeline through Turkey. The gift of 350,000 barrels a day is a long way from Iraq's pre-war exports of 3.2 million, however, and the new pipeline cannot be completed until the late 1980s.

Both nations face another unpredictable factor: how long their armed forces will fight in support of their present regimes. While no one can question the courage of both sides, a war of attrition tends to stretch armies until they "snap."

The war has brought both nations to the point where each future encounter will strain the political, economic, and social fabric of both sides. . . . Either side could collapse for reasons that otherwise would seem militarily unimportant . . .

This collapse could come at any time or never. Iran launched its second major offensive on April 10th. In spite of all the casualties it has suffered, it was still able to attack on a 20-mile front between Ayienehin and Zobeidat, roughly 50 miles west of Dezful, and to sustain thousands of casualties per day. Iraq was still able to mount an effective defense and to fly nearly 100 close air support sorties per day. There is no clear military reason why either side should lose its ability to checkmate the other or lock it into a continuing war of attrition.

The point does come, however, when an army takes too much. It may not be visible from the outside, but its steady losses of officers and NCOs and the hopeless position of its enlisted men—who come to feel they have no future other than death or a living hell—destroy the internal cohesion of the force, its loyalty to its high command and government, or its ability to make yet another effective effort. Both sides have reached the point where such an internal collapse is becoming increasingly possible, although Iraq may have a slight advantage because its improving defensive tactics seem to be producing acceptable casualties and involve less strain than Iran's costly offensives.

While it remains possible that Iraqi forces could lose, this seems as likely to occur because of internal Iraqi resentment of Sadam Hussein as because of any Iranian military gains. In contrast, it seems doubtful that Iran could lose the war in the sense of creating a direct Iraqi military threat to the Iranian regime or Khuzestan even if the Khomeini regime collapsed or Iran's army broke under its growing weight of casualties. The prospects of any new advance on Iran are scarcely likely to be attractive enough to lead Iraq into any further adventures.

Both sides have, in fact, reached the point where they badly need to re-equip and obtain new military technology. Iran has had to pull most of its remaining high-quality forces away from its borders with the USSR and Afghanistan, and Iraq has had to pull units out of its Kurdish areas even at the cost of abandoning some units to its Kurdish rebels.

In short, the war has brought both nations to the point where each future encounter will strain the political, economic, and social fabric of both sides. This, plus the loss of skilled military personnel, makes it possible that either side could collapse for reasons that otherwise would seem militarily unimportant—or that both sides could move toward some type of temporary peace or stalemate, if only to gain time to rearm.

The Consequences of the War of Attrition for the West and the Gulf

Several things *are* likely regardless of which side wins and what happens to each regime:

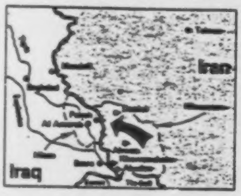
- **Massive Rearmament:** The war has built up tremendous hatreds and tensions on both sides. Regardless of what happens, both sides will likely race to rearm. Even if a new regime should initially seem to be willing to accept peace or support a "victory," the divisions between the states will drive them to rebuild their forces and seek military superiority.

Both sides need to replace at least half their pre-war armor and need at least 1,500 new tanks each with fully modern fire control and advanced armor. Both sides are already seeking to buy several hundred advanced attack helicopters and are seeking to place orders for more advanced surface-to-air missiles. Both sides have lost 80–150 combat and transport aircraft and must find 250–400 "next generation" fighters with at least the quality of the F-20A, Mirage 2000, or ACA.

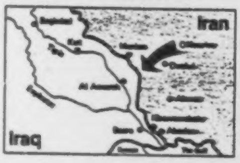
Table Three

The First Iranian Offensive of 1983

Location Relative to the Offensives of 1982



Main Offensive Thrust



Scene of the Fighting

To Baghdad
Iran
Al Amarah
Iraq
To Basra

The only nation that can provide massive arms supplies rapidly is the USSR. This is likely to thrust one nation into increased dependence on the Soviet Union despite the fact that both have now systematically purged and suppressed their own Communist parties and pro-Soviet elements.

France may, however, offer Iraq a limited alternative. France desperately needs an export market for its arms and has agreed to deliver some 31 more Mirage F-1 fighters to Iraq in 1983; it may soon deliver five specially equipped Super Etendards with Exocet missiles to allow Iraq to attack the material shipped to Iran's oil loading facilities at Kharg Island.

The two countries are also bound together by the fact that Sadam Hussein's regime now owes France some $7.2-billion and has guaranteed $2.2-billion more in export loans. Hussein cannot repay these loans unless he receives the arms to remain in power. Any successor's regime seems likely to renege upon them.

- **Large-Scale Transfers of New Military Technology:** The current fighting, and the fighting in the Falklands and Lebanon, has highlighted the benefits of advanced technology to the point where the resulting arms race is likely to be a high technology race. This will threaten the southern Gulf states and create a strong incentive for nuclear proliferation. There are already reliable reports of growing Iranian and Libyan contact in nuclear weapons development.

The only nation that can provide massive arms supplies rapidly is the USSR, although both have now systematically purged and suppressed their own Communist parties and pro-Soviet elements.

- **An Oil War in the Gulf:** The Gulf states are already threatened by a literal "spillover" of the Iran-Iraq War into a Gulf oil conflict. Uncapped wells have been pouring thousands of barrels of oil per day into the Gulf since February, and this is creating a massive oil spill which now threatens ports, desalinization facilities, and power plants throughout the Gulf. While a tanker collision with an oil rig contributed more to this crisis than Iraq's attacks on Iran's offshore Nauroz field, the current crisis is showing that even the most token "oil war" can threaten the entire Gulf.

The aftermath of the fighting seems almost certain to result in a different, but even more serious, "oil war." Both Iran and Iraq will have to compete strongly for oil revenues and will have an incentive to put the severest possible pressure on Saudi Arabia, Kuwait, the UAE, and other Gulf oil exporters.

This, plus the problem of debt repayment, makes it possible that Iraq will renege on its debts to its fellow Arab states and become actively hostile to them if Sadam Hussein is overthrown. Even Sadam Hussein may take this path. He will no longer need his present conservative allies if he can survive the war, and his need to compete for a share of the oil market and minimize his debts may well shift him back to opposing the moderate Arab states.

Saudi Arabia may have taken steps to offset this possibility by offering to finance an Iraqi oil pipeline through Saudi Arabia to a port on the Red Sea. If completed, such a pipeline would be a limited hostage to Iraq's good conduct. Iraq, however, is also expanding its pipeline through Turkey and its future problem seems more likely to be cash, not finding a port to ship its oil.

Under such conditions Iraq might try to force the southern Gulf states to reduce production and resume its opposition to both their collective defense efforts and informal ties to the West. Sadam Hussein might even bargain with the Devil and join Iran in putting such pressure on the southern Gulf, and any successor might be even more ruthless in demonstrating Iraq's ingratitude to the other Arab states.

- **Growing Religious and Political Conflict in the Arab World:** The current fighting may only have stayed confined to Iran and Iraq only because Iran lacks the air power to strike at the southern Gulf states. The tone of Iranian broadcasts toward Saudi Arabia has shifted to a level of virulence that makes Iran's broadcasts toward Iraq seem almost mild.

Iran has already turned OPEC into the scene of a politico-economic war with Saudi Arabia and has attempted to subvert the pilgrimage to Jiddah, Makkah, and Medina. It has put massive pressure on Kuwait and the UAE not to support collective defense initiatives in the Gulf Cooperation Council and has increased its training and subversive activity throughout the southern Gulf.

While Algeria, the PLO, and South Yemen have taken a low profile in the Solidarity and Confrontation Front, Libya, Syria, and Iran have united to declare that Sadam Hussein must be destroyed and to condemn any meaningful peace initiative.

Further, the Khomeini and Assad governments are steadily backing efforts to unite the various Shiite sects of Lebanon (where the Shiites are an underprivileged majority of the Moslem population), Syria (where the Shiites are a ruling minority), Iraq (where the Shiites are a majority), Iran (dominantly Shiite), and the southern Gulf (where Shiites are an important part of the populations of Kuwait, Bahrain, Saudi Arabia, and the UAE).

This may ultimately trigger a broad politico-economic struggle between the southern and northern Gulf with strong religious overtones. This is particularly true if a new regime comes to power in Iraq.

Fortunately for the West and the moderate Gulf states, these developments will take time to become deeply threatening. Iran and Iraq will take several years to rearm and sort out the political and economic consequences of the war. In the short run, they may even force major cuts in oil prices as they struggle for oil revenues, thus speeding the West's recovery. One or both may bog down in internal turmoil.

The issue will be whether the West and the Gulf states use this time to build a strong deterrent in the southern Gulf, to develop credible collective defense options under the Gulf Cooperation Council, and to expedite the ability to move in USCENTCOM forces from over the horizon.

If they do not, the West faces the grim prospect of another oil crisis or conflict at just the point where world oil demand has recovered; the Gulf faces the prospect of becoming the cat's paw of Iran and/or Iraq. In this sense, security policy in the Gulf is exactly like roof repair: sooner or later, it will rain. If the roof isn't fixed, it will leak. ■☆■

Senator **Warner**. Thank you, very much.
Dr. Conant.

STATEMENT OF DR. MELVIN A. CONANT, PRESIDENT, CONANT & ASSOCIATES, LTD.

Dr. **Conant**. I'll try to speak equally telegraphically and I will make my comments in the form of prepositions and move through them as rapidly as possible.

First with respect to the world petroleum outlook for 1984, I believe that the single most fundamental factor affecting that will be the extent to which the OECD in general establishes a record of slow improvement in its general economic situation. The signals for that recovery are not yet clear enough to indicate that there will be any significant increase in energy demand, most specifically including oil, hence an upheaval in the gulf could well result in a temporary increase in price for all of the reasons that we heard this morning. But I do not believe that price increase would be sustained.

In view of the fact that I discount the possibility of an OECD economic—which alone would provide the strengths to support a sudden spurt in the prices of oil. Moreover we have surplus inventory, surplus tankers, surplus refining capacity, surplus crude. In most parts of the world we have the strategic stockpiles that we never had before. Government decision, part of our own and allies, move decisively to defuse the speculative aspects of price increases should we enforce the observation. Price could not be sustained as a result of producer or speculator actions.

However, I have to admit that the United States' view about energy, the administration's view, which is one I ascribe largely to relaxation about energy, is totally inadequate to the outlook. The

However, I have to admit that the U.S. view about energy, the administration's view, which is one I ascribe largely to find this misleading. An even marginal increase in OECD import demand would find us returning directly to OPEC suppliers and spare capacity among the non OPEC providers is so very small, perhaps less than a million barrels a day. I'm also sorry to report on the part of American industry, it's also more relaxed than I would feel comfortable about. Here I would like to single out for your attention the remarks made by the manager of the corporate energy group, Johnson & Johnson, on what his company is doing as a matter of course. His transient observations I'd like to suggest be included in the record.

Senator **Warner**. Without objection.

Dr. **Conant**. Elsewhere, since we're talking about the world petroleum outlook, we have to consider the attitude of our allies toward supplies and what their vulnerabilities appear to be. First of all they will emphasize the lack of success in adding significantly to reserves outside of the Middle East. There have been a great many years since there have been significant additions to supplies beyond that region. Allies tend to think that this is the single most important observation to be made about supply in the longer run, but anticipating the consequences of this in 1984, the allies will also stress the comment that I made that a slight rise in OECD GNP will throw them right back into the OPEC suppliers.

They are also convinced of the increasing importance of the Middle East, that over the next few years we're going to find OPEC members and other suppliers fading in importance. Their prospects are dimming without these additional discoveries and our adherance to gulf sources will become even more marked.

I think the allies would agree that the danger of an oil upheaval is confined primarily to—no longer political uses of oil thought to be a feasible instrument. Allies will also stress the role in the IEA. We had enough discussion perhaps on this point this morning. Let me emphasize simply that allies are in my view appalled at the prospect of a United States which is still the largest importer of crude in the world, the largest consumer of energy in the world, accepting a philosophy in which price determines allocation. They're too vulnerable to accept the philosophy of that sort.

I find myself therefore much closer to the European and Japanese views when they do ask when and how will the strategic petroleum reserve be used, either in terms of our own direct benefit or in terms of assistance to them, all of whom are incidentally within NATO.

This committee, Senator, has a broad view of petroleum outlets. You have not confined your attention to the economists only. You have asked the foreign policy, the defense implications as well. Let me suggest if I may an agenda for you, your committee in 1984.

First of all I recommend to your closest attention a U.S. Geological Survey report issued in the end of 1983 on the prospect for world oil discoveries. I have a copy with me. With your permission I would welcome it being introduced into the record.

Senator **Warner**. Without objection.

Dr. **Conant**. The study warns us as we have been warned before of this failure to discover significant additional findings of crude. It also emphasizes changes in the importance to producers likely to happen over the next few years, inadequate attention to heavier oils, extraction of bitumin and the lack of interest in sharing recovery techniques. It is a solid and very important document which in my experience has been more carefully studied abroad perhaps than in our own red, white and blue.

I hope you would maintain on your agenda pressure on the administration concerning emergencies. I agree completely with what Senator McClure and Senator Metzenbaum have said on this point. The failure to have an antitrust clearance is awesome. The emphasis on voluntary contributions to fill oil supply gaps is baffling. I do not understand how an administration or a Congress could survive the political fire storm that would come if we had a true crisis and you had to tell your constituents including myself, Mr. Chairman, that I couldn't get it, I wasn't wealthy enough. I find this unacceptable.

I have another point to make. The fire storm that would come under this country would also scorge the American petroleum industry and I think this is a genuine national asset. And if the industry does not itself come forward with support for the kinds of allocation planning that any reasonable person would expect, then it will have to be done, I would rather have that done in a quiet moment than in the heat of a confrontation.

Synfuels, the collapse of the Synfuels Corporation is I think a matter which ought to be of deep concern. Why has this happened? Is there something beyond just the relaxation of interests and energy? I don't know. But I would hope that your committee would look at this experience and ask whether it has worked out as it ought to have or whether a new start could be made and do it perhaps better.

Natural gas, my feelings are that the administration were to decide that deregulation had a very high priority as it should have, then maybe this is your judgment. It could pass. Without that administration commitment to it, as an outsider looking at the Congress, I fail to see any progress being made. It must remain on your agenda. I'm almost at the end.

Mr. Chairman, the last 6 months we've had what I think is more than just an interest in change and structure in the American petroleum industry. Whether mergers, buy-outs, and buy-ups are to be viewed solely in the light of what is said to the stockholder interests or whether there is a larger concern, a larger constituency behind changes of the kind that are current. It seems to me, the entirely appropriate topic for your agenda. I suspect there is a national interest in this matter and while it need not reverse the interest of stockholders there should not be an assumption that they are equal until that has been more carefully examined.

Specifically it seems to me, and I think Senator Evans made this point and several others also, we must increase our efforts to add to reserves. That need not be interpreted just as adding to the reserves of a particular company, but to the national energy budget.

Is the national interest engaged in what is a new kind of divestiture to the royalty trust proposals of certain individuals? Is that going to be in the national interest of this country? I hope that this will be on the agenda as well. My final point which has been discussed today on nuclear power, it seems to me that wherever the problems lie in the escalation of cost or in lowered electric demand, we're talking about an area in national interest in which there may now have to be a different Federal rule. If the private sector can not manage in present circumstances and your committee can turn in which of those circumstances may lie in the fault or in the area of the private sector and which do not, then I would hope you would give renewed attention to the question of what kind of a role the Federal Government will preserve this option.

Hence, my world petroleum outlook for 1984, Mr. Chairman, is a mix of U.S. domestic and international interest. It's always been that way and it will not change within the next 12 months. Thank you very much.

[The prepared statement with attachments submitted by Dr. Conant follows:]

Melvin A. Conant
President, Conant and Associates, Ltd.
Editor, Geopolitics of Energy

Testimony before
U.S. Senate Committee on Energy and Natural Resources
January 30, 1984

The World Petroleum Outlook for 1984 will be determined primarily by the extent of economic recovery in the OECD community of free industrial states. If, as seems to be today's general opinion, OECD GNP growth rate may not exceed 2%-2.5%, the level of energy demand will remain low, gas, coal, and oil will remain generally in surplus; energy prices will be depressed with widespread pressures edging them downward.

A major shortfall in international oil supply -- such as could ensue in the Middle East Gulf -- would probably bring with it a sudden surge upward in price. But given the surplus of spare exporting and refining capacity, and surplus tankers, adequate inventories, strategic stockpiles (including the Saudi "float" of as much as 50 MMB), and assuming no concurrent, significant OECD economic recovery, it is unlikely that a speculative surge in oil prices could be sustained.

In terms then of the general outlook, the world's petroleum trade will most probably be throughout 1984 much as it has been in 1982 and 1983. The pervasive air of energy relaxation found in the United States will continue, with many assuming supply to be plentiful, and cheaper, with commercial or market considerations determining the terms of trade. The administration will repeat its observation that well over half of the world's production of oil comes from non-OPEC sources.

Elsewhere, our allies will continue to view the oil scene differently. While the United States is also dependent (to a lesser degree) on oil imports, still its dependency is increasing, once more. We should pay attention to the views of other consuming nations. For them:

(1) The lack of success in adding significantly to free world oil reserves outside the Middle East is a matter of serious and deepening concern.

(2) Their greater dependence on imports (70% of oil consumption) causes them to look more closely at the present and prospective sources of supply. While it is obvious that OPEC suppliers have suffered most in the cutbacks due largely to the depression, our allies note that when recovery sets in, there is less than one MMB/D of spare export capacity among non-OPEC suppliers; there are nearly 11 MMB/D of spare capacity among OPEC suppliers. Even a slight rise in energy demand will turn OECD economies back to OPEC; there will be no other option for the additional international barrel.

(3) Moreover, with signals accumulating of declining production for export from nearly every OPEC member outside the Middle East, a few years from now -- if not in 1984 -- as much as 90% of international oil trade will come from the Middle East Gulf. Anticipation of this prospect will begin to drive the energy policies of many OECD states, quite possibly in 1984.

(4) For as long as the U.S. dollar remains the medium for oil trade, and oil prices remain high relative to the trade earnings of developing countries, 1984 will be little different from the past decade. An unending effort will have to continue to pay for oil imports through a mix of commerce, borrowing, and renegotiation (stretching-out) of loans. Note the World Bank figure for Third World indebtedness in 1983: $810 billion (1973: $110 billion) and that indebtedness will continue to grow. For as long as the U.S. dollar is stronger than other OECD currencies, a modest decrease in world oil prices offers OECD importers no relief -- which is to say that oil continues to have repercussions beyond energy itself.

(5) Our allies would argue there is less chance in 1984 of politically-inspired embargoes/boycotts plaguing international oil trade. The risk today, and for years to come, of cutbacks in supply comes from conventional-type war damage or surprise guerrilla-type attacks on key facilities. From the importers' viewpoint, the International Energy Agency (IEA) remains the only multilateral instrument for coping equitably for consequent shortfalls in supply.

The extent to which the United States considers IEA important will determine the organization's usefulness; for as long as their energy needs parallel our own, the spectre of unbridled competition for supply in times of emergency haunts each importer, if not the United States. It is no secret that our allies have been given cause to worry about U.S. intentions despite the creation of a U.S. Strategic Petroleum Reserve (SPR), now over 350 MMB, by the administration's refusal to define why and how the SPR could be drawn upon to meet U.S. needs, and possibly help allies.

These views of allies about the world petroleum outlook for 1984 seem to analysts such as myself to be in closer touch with the realities of oil and its political and economic environment. In summary, allies are perplexed by the extent to which the U.S. defines supply in commercial terms, as if oil were now no different from soybeans or pork bellies. Did all of the tumultuous changes of the 1970s never happen? Is oil not now of strategic interest?

The Senate Energy Committee (and its predecessor, the Interior Committee) has led in focussing attention on the range of national interests embedded in energy availability. The Committee has chosen to emphasize the longer-term implications to this country of a simple continuation of past and present trends, while addressing current issues, such as in this hearing. In so many of its sessions and reports, the Committee has emphasized the total context in which energy flows -- including its political, security, and economic environment. Because of this, and because of my own background in the private and public sector, I find the kinds of concerns which presently engage our allies more persuasive than the views of the administration. I suggest the following is a plausible link between the World Petroleum Outlook for 1984 and what might be on your agenda for 1984:

#1 The U.S. Geological Survey (USGS) completed in late 1983 the most detailed and authoritative review of the prospects for future discoveries of oil, worldwide. Its conclusions warn, again, of trends in fewer significant discoveries, of the generally dimming prospects of present producers, and the pitifully inadequate scale of anyone's effort to exploit the already-known unconventional crudes, and of the application of tertiary enhanced recovery techniques. Is the failure to discover and to exploit predominantly the result of economic conditions affecting the oil industry? Are incentives lacking? Or are our technical advances in oil exploration simply failing to discover what some believe still lies -- somewhere? Or have the very large basins all been surveyed and there are no more? It is time that we look again at our record, our prospects, and what our options may be. Could the USGS report be made part of the record of this hearing?

#2 The Energy Committee has long been concerned about the extent to which this nation is prepared, alone, or in concert with others, to cope with sudden oil shortfalls. Many of us believe that without your continuing attention, we might have a very much smaller SPR -- or, quite possibly -- none at all.

It seems inexplicable to me that such basic matters as anti-trust clearances for the companies to work together in an emergency is not given priority by our Executive.

It is also inexplicable to me how any responsible and experienced person can believe that in an emergency allocation of supply through price -- he who has the money will get it -- could survive as a national policy after the political fire storm which would sweep this country in protest; or how the oil industry can conceivably believe it would remain unscorched.

Whatever mistakes may have been made in the past in coping with supply, it is vital to our energy industry and to the energy interests in our society that there be immediate efforts to define in advance how we shall deal with supply emergencies in equitable ways and thus be acceptable to our citizens. I am worried about the kinds of reactions which would inflict damage on our industry if the rectification of government policy occurs during a crisis, in great haste and anger.

#3 In close relationship to the above, this Committee is looked to in assessments of how ready the SPR is to supply: who gets it, when, in what form (crude, product), at what rate -- and not in planning only but through actual, wholly realistic exercises of the capability to deliver. Enough was revealed in 1983 to cast serious doubt on the readiness of the SPR to meet crisis needs. Is 1984 going to be better?

#4 Four years ago, in a bipartisan vote, the United States embarked on an expensive but (then thought) essential effort to strengthen our nation's energy assets through a national synfuels program. Today, that effort fails whether through inattention, incompetence, irresolution, or because the administration made choices which rendered the original goals unattainable, I can only guess.

We will have the need for synfuels. Why is it that critics maintain our political system makes sustained, long-term commitments to advance national energy interests impossible? Are they right? Snyfuels is about to disappear with scarcely a trace of what it was intended to accomplish. Will there be no inquest? Can we do no better? 1984 could be the opportunity to reexamine and redefine our interest in synfuel technologies.

#5 In our society and system we have a clear preference for the private sector and a minimum government presence, much less an involvement. But in a highly critical energy area -- natural gas -- it appears to me that the administration has failed to make the necessary effort, in conjunction with allies in this Committee, to right what is palpably a chaotic gas industry and market by moving on the earlier deregulation of natural gas.

We have no better way of determining the facts of our energy situation and likely prospects than to let domestic supplies be tested in the market. Yet this quite crucial matter of gas seems now to be getting a lower priority, in a national election year. Will it be on your agenda, with its requisite priority, or will there be little point in listing it without a clear White House signal of presidential support?

#6 The wave of mergers and buy-outs and buy-ups in the industry is likely to continue in 1984 with very large sums of money chasing a national reserve asset which is not being significantly increased. Some of this "restructuring" or changes in ownership may or may not be good news for a few stockholders in particular, or for stockholders generally. Is there a national interest in this process which might hold that these trends do not seem to add one barrel to national energy reserves? Or to the prospect of ever greater exploration efforts? Is a further fragmentation (the "ROYALTY TRUST" PHENOMENON) OR CONCENTRATION of the U.S. petroleum industry in the national interest? Should this Committee have the question on its 1984 agenda? This is a very difficult arena in which judgments have to be carefully made in the light of what is properly the domain of the private sector and what may be in a larger context the domain of government and its different responsibilities.

#7 Important in itself but mentioned here because it bears on the petroleum prospect, is the rise and fall of nuclear power in the United States. Once again, if this is on your agenda, one begins by emphasizing several aspects:

(a) A continuing fall in the share of nuclear power affects the demand for oil -- domestic or imported -- especially if there is judged to be a relatively long-term competitive price for resid versus coal.

(b) The nuclear industry in the U.S. is a peculiar hybrid product of the private and public sector. Is there going to be in 1984 reason enough to reexamine the stake of the nation in this alternative? If so, then how best address the reform of private sector efforts and performance and then the extent to which federal financial or other support is warranted?

In conclusion, the Committee will continue, through 1984 -- and in the years to come -- to find that our nation's dependence, and that of allies, on internationally traded oil will still have far-reaching domestic and foreign implications. To the extent we address our energy vulnerabilities, we must look at domestic and world forces and trends affecting the petroleum outlook and that is, in my view, the only acceptable premise, one which this Committee has steadfastly maintained.

A CURRENT ENERGY ASSESSMENT FOR THE INDUSTRIAL USER

Frank J. Santangelo, Manager
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(Text of remarks at the Sixth World Energy Conference, November 30, 1983)

IN THE 1970s, AFTER THE OIL EMBARGO OF 1973, INDUSTRY'S ATTITUDE TOWARD ENERGY USE CHANGED FROM A LACKADAISICAL ONE TO A FEAR THAT THE EVERYDAY CONDUCT OF BUSINESS WAS THREATENED. FIRST IT WAS THE SHORTAGE OF SUPPLY THAT WAS CREATED. AND THEN, IN EACH SUCCEEDING YEAR, THE SKYROCKETING INCREASE IN THE COSTS OF ENERGY.

ENERGY CHALLENGED LABOR AS THE FASTEST-RISING COST COMPONENT OF PRODUCTION FOR PRODUCTIVITY CALCULATIONS. A NEW APPROACH WAS NEEDED BECAUSE THE TRADITIONAL RESPONSE OF SUBSTITUTING ENERGY AND EQUIPMENT FOR LABOR COULD NO LONGER BE JUSTIFIED AUTOMATICALLY. ALSO, PLANNING FOR THE INTERRUPTION OF SUPPLY BECAME ONE OF THE PRIME FUNCTIONS IN DOING BUSINESS. CONSERVATION, BECAUSE OF COST, WAS IMPORTANT SINCE IT BECAME MORE AND MORE A FACTOR IN THE PLANT'S OPERATION AND INFLUENCED PRODUCT COSTS.

MUCH PROGRESS WAS MADE, AND RATHER QUICKLY, IN ADDRESSING THE ENERGY ISSUE --- PUTTING IT INTO PROPER PERSPECTIVE. A NEW BREED OF PEOPLE CAME ON THE SCENE; ENERGY DIRECTORS, ENERGY MANAGERS, ENERGY SUPPLY CHIEFS, ETC. ENERGY PROGRAMS WERE DEVELOPED. ENERGY BECAME THE SINGLE MOST IMPORTANT CONSIDERATION WORLDWIDE. NEWS HEADLINES EVERYDAY PLAYED ON ENERGY SHORTAGES AND PRICE ESCALATION.

IN OUR HOMES AS WELL, ENERGY CONFRONTED US AS THE COMMODITY WITH THE GREATEST POTENTIAL FOR CONTINUED PRICE INCREASES. THEREFORE, WE INSULATED OUR HOUSES, WE CAULKED OUR WINDOWS AND WALKED MORE. WE ALL CAME TO REALIZE THAT ENERGY IS A BASIC NEED IN INDUSTRY, IN COMMERCE AND IN OUR HOMES.

THE CURRENT EASING OF ENERGY SUPPLY AND COSTS SHOULD BE GRASPED AS A REPRIEVE, GIVING US TIME TO ESTABLISH OUR LONG-RANGE POSITION. UNFORTUNATELY, WE ARE NOT TAKING ADVANTAGE OF THIS TEMPORARY PAUSE. ALMOST CERTAINLY WE WILL EVENTUALLY RETURN TO SUPPLY SHORTAGES, AND WITH THEM, INCREASING COSTS. WE SEE THIS LACK OF CONCERN IN EVERY SECTOR OF THE ECONOMY, FROM OUR GOVERNMENT DOWN TO OUR PERSONAL ATTITUDES.

TO RELAX AND THINK OUR ENERGY PROBLEMS HAVE VANISHED WOULD BE A TRAGIC MISTAKE. THE EXISTING ABUNDANT ENERGY RESOURCES SUGGEST THAT OPEC'S BACK HAS BEEN BROKEN BY CONSERVATION, FUEL SWITCHING AND NEW NON-OPEC OIL. THE UNITED STATES STILL IMPORTS 25 PERCENT OF ITS OIL. OIL STILL REPRESENTS 40 PERCENT OF OUR ENERGY NEEDS. THE RISING PRICE OF OIL EXPERIENCED IN THE 1970's MADE EXPLORATION OF NEW OIL VERY VIABLE. BUT IN RESPONSE TO LOWER PRICES, OIL EMPHASIS HAS REDUCED EXPLORATION AND DRILLING BUDGETS. THIS ADDS TO U.S. RELIANCE ON THE PERSIAN GULF. THIS RENEWED DEPENDENCE COULD TURN A SUPPLY INTERRUPTION OR PRICE INCREASE IN MIDDLE EAST OIL INTO AN ECONOMIC CRISES. SO, WE ARE IN A CATCH 22 SITUATION IN WHICH HIGHER OIL PRICES IMPROVE OUR CHANCES TO BE ENERGY SELF-SUFFICIENT BUT LOWER OIL PRICES DISCOURAGE NEW OIL EXPLORATIONS; THEREFORE INCREASING OUR DEPENDENCE ON OUTSIDE SOURCES OF SUPPLY.

CONFUSION EXISTS AS TO WHAT THE UNITED STATES ENERGY POLICY IS OR SHOULD BE. THE ADMINISTRATION INSISTS ON A "FREE MARKET" ENERGY POLICY THAT HAS ALREADY REDUCED FUNDING FOR THE STRATEGIC PETROLEUM RESERVE, SYNTHETIC FUELS, CONSERVATION RESEARCH, AND REDUCED RESEARCH FUNDS FOR RENEWABLE ENERGY RESOURCES. ENERGY SECRETARY HODEL HAD TOLD A SENATE ENERGY PANEL THAT DECLINING OIL IMPORTS HAVE DEFLATED THE PERSIAN GULF'S STRATEGIC IMPORTANCE TO THE U.S. HOWEVER, THE ADMINISTRATION VIEWS THE MILITARY'S RAPID DEPLOYMENT FORCE AS ESSENTIAL FOR THE PROTECTION OF SAUDI OIL FIELDS AND HAS INDICATED THAT MORE THAN $2.3 BILLION WILL BE SPENT ON THIS FORCE IN THE NEXT THREE YEARS.

IN THE ERA OF CHEAP ENERGY VERY LITTLE EFFORT WAS MADE TO CONSERVE, NOR WAS ANYONE REALLY CONCERNED. INDUSTRY SHOWED THIS ATTITUDE. INDUSTRIAL BUILDINGS WERE DESIGNED WITH ENERGY CONSIDERED ONLY AS A MEANS OF SUSTAINING A FACILITY. PROCESSES AND MACHINERY WERE BUILT WITH GREATER-THAN-NECESSARY SAFETY FACTORS FOR OPERATING THE EQUIPMENT. BOILERS AND AIR CONDITIONING EQUIPMENT WERE OVERSIZED. BUT THEN, THE DRAMATIC INCREASE IN ENERGY PRICES IN THE 1970S PROVIDED AN INCENTIVE TO REDUCE ENERGY COSTS. SINCE THEN, INDUSTRY HAS BEEN TRYING TO INTEGRATE ENERGY SAVINGS INTO THE BOTTOM LINE. AND WE IN THE INDUSTRIAL SECTOR HAVE SUCCEEDED IN CONSERVING MORE RAPIDLY THAN ANY OTHER SECTOR OF THE ECONOMY. HOWEVER, IT IS FAR BELOW ITS ULTIMATE POTENTIAL.

ENERGY CONSERVATION IN INDUSTRY DOES NOT AUTOMATICALLY HAPPEN. TOP MANAGEMENT MUST BE STRONGLY COMMITTED AND GENUINELY INTERESTED. THEY MUST BE PERSISTENT IN THEIR COMMITMENT TO CONSERVE AND MUST COMMUNICATE THIS COMMITMENT DOWN THE LINE. THERE MUST BE ONE OR MORE PERSONS, DEPENDING ON THE PLANT'S SIZE, WITH THE EXPERTISE TO EFFECT A CHANGE AND THE AUTHORITY TO CARRY OUT ITS IMPLEMENTATION. FINALLY, ENERGY USE MUST BE BUILT INTO THE PARAMETERS OF EACH OPERATION OF A FACILITY. IT MUST BE CONSTANTLY MONITORED AND THE MANAGERS HELD ACCOUNTABLE FOR ITS USE. WE CANNOT EMPHASIZE ENOUGH THIS COMMITMENT TO CONSERVE. JUST TO MAINTAIN THE LEVEL OF CONSERVATION ALREADY ACHIEVED BECOMES A MAJOR CHALLENGE. IT IS MUCH EASIER TO SLIP BACK INTO THE OLD WAYS. ALL THE "NO COST" HOUSEKEEPING CHANGES THAT WERE MADE IN THE BEGINNING HAVE A TENDENCY TO BECOME UNIMPORTANT.

IN TODAY'S ATMOSPHERE, WITH AMPLE ENERGY SUPPLIES AND THE ACCEPTANCE OF ITS HIGH COSTS, HAVEN'T SOME OF US AGAIN GIVEN ENERGY A LOW PRIORITY IN OUR OPERATIONS? I WOULD BE LESS THAN CANDID IF I SAID THAT WE AT JOHNSON & JOHNSON ARE NOT EXPERIENCING SOME OF THIS "BACK BURNER" ENERGY INTEREST.

HOW DO YOU GET AND MAINTAIN THIS COMMITMENT WHEN THERE ARE NO HEADLINES TODAY RELATING ENERGY SHORTAGES AND CRISES? RATHER, ALL WE HEAR IS THAT THERE ARE AMPLE SUPPLIES AND ENERGY CRISES ARE BEHIND US. THESE FACTS WE HAVE TO LIVE WITH. HOWEVER, SEVERAL OTHER BARRIERS EXIST TODAY THAT WE CAN DO SOMETHING ABOUT.

COMPANIES WITH SCARCE CAPITAL WOULD RATHER INVEST IN A NEW PRODUCT OR ADDED CAPACITY THAN IN ENERGY SAVING INVESTMENTS.

LET'S EXAMINE THIS: AN ENERGY PROJECT MAY MEET ALL THE COMPANY'S CRITERIA FOR PAYBACK BUT STILL OTHER PROJECTS GET THE MONEY. IS IT BECAUSE OF THE POOR SELLING JOB? ARE THE DATA INCOMPLETE AND INADEQUATE? IS THE TECHNOLOGY APPROPRIATE FOR THE APPLICATION? IN FACT, HAS OUR HOMEWORK BEEN DONE? WHAT ABOUT FUTURE ENERGY COST PROJECTIONS AS THEY RELATE TO THE PROJECT? HAVE WE USED SOME OF THE CONFUSING PROJECTIONS OF SOME SO-CALLED EXPERTS WHO PREDICT THAT, FOR INSTANCE, THE VALUE OF ENERGY IS INCREASING, WHEN ACTUALLY THE REAL PRICE OF RESIDUAL OIL HAS DECREASED? WILL THE REAL PRICE INCREASE OR DECREASE IN THE FURUTE? WHAT ABOUT NATURAL GAS PRICES? HOW WILL DEREGULATION EFFECT THIS? THIS ALL TENDS TO CONFUSE TOP MANAGEMENT AS THEY TRY TO DETERMINE THE VIABILITY OF A PROJECT.

GOOD INDUSTRIAL PLANNING HAS TO CONSIDER ENERGY IN THE OVERALL BUSINESS PLAN. TODAY THERE ARE AMPLE SUPPLIES OF ENERGY RESOURCES. CONSIDERATION, HOWEVER, MUST BE GIVEN TO PROVIDING CONTINGENCIES IN THE EVENT OF DISRUPTION OF ENERGY SUPPLIES SO THAT OUR OPERATIONS CONTINUE. THIS STORY MUST BE TOLD AND MANAGEMENT MUST BE CONVINCED THAT THE THREAT TO OUR DOING BUSINESS IS REAL.

BACK IN 1973, AT THE TIME OF THE ARAB OIL EMBARGO, WE AT JOHNSON & JOHNSON AS WELL AS THE WHOLE INDUSTRIAL COMMUNITY, BECAME CONCERNED - AND RIGHTFULLY SO - THAT OUR OPERATIONS WERE THREATENED WITH MAJOR DISRUPTIONS. THE COST OF ENERGY WAS NOT SIGNIFICANT, WITH OIL SELLING AT ABOUT $2.50 PER BARRELL, BUT OPERATIONAL SURVIVAL DEPENDED ON ENERGY SUPPLIES.

A CORPORATE PLAN HAD TO BE DEVISED TO MEET THE EMERGENCY. DAVID R. CLARE, PRESIDENT OF JOHNSON & JOHNSON, ASSEMBLED THE VICE PRESIDENTS OF OPERATIONS OF ALL JOHNSON & JOHNSON DOMESTIC COMPANIES AND LAID OUT HIS PLAN. HIS PLAN WAS TO ORGANIZE A JOHNSON & JOHNSON ENERGY STEERING COMMITTEE WHICH WAS TO INCLUDE THE VICE PRESIDENTS OF OPERATIONS AND DIRECTORS OF ENGINEERING FROM ALL COMPANIES IN THE U.S. ITS INITIAL OBJECTIVE WAS PROTECTING OUR FACILITIES FROM A POTENTIAL SHUTDOWN DUE TO A SHORTAGE OF ENERGY.

THIS COMMITTEE IS VERY MUCH ALIVE TODAY. ALTHOUGH ITS PRIME OBJECTIVE IS STILL THE SAME, THE MISSION OF THE COMMITTEE HAS EXPANDED TO INCLUDE CONSERVATION AND COST AVOIDANCE.

THE CORPORATE ENERGY GROUP, WHICH IS PART OF OUR CORPORATE CONSTRUCTION DEPARTMENT, ADMINISTERS THE FUNCTIONS OF THE STEERING COMMITTEE. THESE INCLUDE:

1. DEVELOP AND IMPLEMENT CORPORATE ENERGY STRATEGY

   THIS INVOLVES THE REVIEW OF ANY ENERGY MATTER THAT COULD AFFECT THE CORPORATION IN GENERAL. SUCH THINGS AS MAKING RECOMMENDATIONS TO OUR COMPANIES ON PAYBACK PERIODS TO BE CONSIDERED ACCEPTABLE FOR ENERGY-RELATED PROJECTS: SETTING TEMPERATURE AND LIGHTING STANDARDS; AND OTHER GENERAL CONSERVATION CRITERIA. ALSO, DECISIONS ARE MADE ON HOW TO COPE WITH GOVERNMENT REGULATIONS.

2. ASSURE CONTINUTIY OF OPERATIONS

   THE COMMITTEE SETS POLICY AS TO THE RECOMMENDED MEASURES EACH COMPANY SHOULD TAKE TO SUSTAIN PRODUCTION NEEDS OVER A SPECIFIC PERIOD OF TIME IF ENERGY DISRUPTION OF SUPPLY OCCURS. THIS IS REVIEWED PERIODICALLY. WHERE POSSIBLE, DUAL FIRING CAPABILITY OF OUR BOILERS (GAS AND OIL) IS MAINTAINED.

3. DEVELOP AND MAINTAIN AN ENERGY PROFILE FOR EACH FACILITY
   UPDATED FILES ARE KEPT ON EACH FACILITY'S ENERGY NEEDS - WHO THE ENERGY SUPPLIERS ARE - AND THEIR CAPABILITY TO MAINTAIN SUPPLY.
4. ANALYZE ENERGY SUPPLY AND COSTS
   I SPOKE EARLIER ABOUT THE INADEQUACIES OF PRICE AND SUPPLY PROJECTIONS FROM VARIOUS SOURCES. A SUBCOMMITTEE MEETS SEMI-ANNUALLY AND WE PROJECT OUR OWN PRICE AND SUPPLY CRITERIA FOR THE NEAR TERM, MID-TERM, AND LONG RANGE ON A REGIONALIZED BASIS, AS IT RELATES TO OUR SPECIFIC JOHNSON & JOHNSON LOCATIONS. THIS INFORMATION IS WIDELY USED BY OUR COMPANIES AND LENDS CREDENCE TO ENERGY COST WHEN AN ENERGY PROJECT IS TO BE JUSTIFIED.
5. OVERSEE ENERGY CONSERVATION PROGRAMS
   ENERGY CONSERVATION PROGRAMS FOR ALL JOHNSON & JOHNSON COMPANIES ARE REVIEWED PERIODICALLY. AT STEERING COMMITTEE MEETINGS SPECIFIC COMPANIES ARE ASKED TO REVIEW THEIR PROGRAMS.
6. MEASURE ENERGY USE AND CONSERVATION
   EACH COMPANY IS REQUIRED TO REPORT ITS ENERGY USE QUARTERLY. A COMPUTERIZED PROGRAM HAS BEEN DEVELOPED AND IS BEING USED. CALCULATIONS ARE MADE TO DETERMINE EACH COMPANY'S ENERGY USE EFFICIENCY AS IT RELATES TO PRODUCTION CHANGES AND CLIMATIC CHANGES. EACH QUARTER IS COMPARED TO THE CORRESPONDING QUARTER OF THE PREVIOUS YEAR. SEMI-ANNUALLY, AN ENERGY REPORT

IS SUBMITTED TO OUR EXECUTIVE COMMITTEE SUMMARIZING EACH COMPANY'S ENERGY EFFICIENCY PERFORMANCE.

7. KEEP ABREAST OF NEW TECHNOLOGIES

   WITH THE BROAD ASPECT INVOLVED IN DEALING WITH THIS SUBJECT, A SPECIAL SUBCOMMITTEE WAS APPOINTED. THIS SUBCOMMITTEE IS CALLED THE TECHNICAL ADVISORY COUNCIL. I WILL DISCUSS THE ACTIVITIES OF THIS GROUP LATER.

8. WORLDWIDE ENERGY STEERING COMMITTEES

   PATTERNED AFTER THE U.S. STEERING COMMITTEE - BECAUSE OF THE SUCCESS EXPERIENCED WITH IT - COMMITTEES HAVE BEEN ESTABLISHED IN OTHER REGIONS OF THE WORLD IN WHICH JOHNSON & JOHNSON HAS FACILITIES. ENERGY AWARENESS HAS BECOME AN INTERNATIONAL CONCERN TO JOHNSON & JOHNSON. EACH OF THESE COMMITTEES REPORTS ITS ENERGY USE TO THE CORPORATE OFFICE AND THE PERFORMANCE OF THE COMPANIES IN EACH OF THESE REGIONAL COMMITTEES IS INCLUDED IN THE SEMI-ANNUAL REPORT TO THE EXECUTIVE COMMITTEE.

THE TECHNICAL ADVISORY COUNCIL - BETTER KNOWN AS THE "TAC" THROUGHOUT JOHNSON & JOHNSON - IS THE BACKBONE OF THE ENERGY TECHNOLOGY EXPERTISE WITHIN THE CORPORATION. IT IS RECOGNIZED AS THE GROUP WITH THE MOST INTIMATE KNOWLEDGE OF ENERGY-SAVING DEVICES AND SYSTEMS. TEN DIRECTORS OF ENGINEERING OR ENGINEERING MANAGERS FROM SOME OF OUR LARGER COMPANIES ARE ON THE COUNCIL. WITH CAPITAL FUNDS RESTRICTED MORE THAN NORMAL, ENERGY PROJECTS MUST COMPETE WITH OTHER TYPES OF INVESTMENTS. THE WORK OF THIS GROUP, THEREFORE, TAKES ON ADDED SIGNIFICANCE. THE DIFFERENT ASPECTS WITH WHICH THE COUNCIL DEALS ARE:

1. KEEP ABREAST OF NEW ENERGY TECHNOLOGY

EVERY DAY NEW ENERGY-SAVING IDEAS COME ACROSS OUR DESKS. SOME ARE "FLY-BY-NIGHT" IDEAS, BUT MANY ARE WORTH INVESTIGATION. THE TAC DISCUSSES ANY NEW TECHNOLOGY AND DETERMINES ITS APPLICABILITY TO ANY J&J COMPANY. FURTHER FOLLOW-UP MAY INVOLVE THE VENDOR GIVING THE COMMITTEE A PRESENTATION ON THE SUBJECT. AFTER DELIBERATIONS, IT IS DETERMINED WHETHER, IN FACT, THE ITEM IS WORTHWHILE. SOMETIMES IT MAY NOT BE POSSIBLE TO DETERMINE ITS FEASIBILITY SIMPLY BY DISCUSSING IT. IT MAY REQUIRE AN IN-TEST ANALYSIS. IF THIS IS DETERMINED TO BE THE CASE, WE DECIDE AT WHICH COMPANY IT CAN BE TESTED MOST EFFECTIVELY AND ENCOURAGE THIS COMPANY TO INSTALL. A MEANS FOR MONITORING ITS PERFORMANCE IS DEVISED. ANY NEW TECHNOLOGY, AS WELL AS PROVEN ENERGY TECHNOLOGIES, IS COMMUNICATED THROUGH THE ENERGY STEERING COMMITTEES AROUND THE WORLD, THUS TOUCHING EACH COMPANY WORLDWIDE. THE COMMUNICATIONS CAN TAKE THE FORM OF FORMAL REPORTS FROM THE TAC, INFORMAL LETTERS FROM THE INDIVIDUAL TAC MEMBERS - THROUGH THE ENERGY TECHNOLOGY HIGHLIGHTS PUBLICATION - AND MINUTES FROM BOTH THE STEERING COMMITTEE AND TAC MEETINGS. PRESENTLY THE TAC IS INVOLVED IN THE DEVELOPMENT OF WHAT WE CALL AN "ENERGY GUIDELINES MANUAL." THIS MANUAL WILL CONTAIN TWO SECTIONS - THE FIRST WILL DISCUSS SELECTED ENERGY AND CONSERVATION ISSUES WITH SINGLE PAGE REFERENCE SUMMARIES ON J&J ENERGY PROJECTS, TECHNOLOGY REVIEWS AND GENERAL REFERENCE ITEMS - THE SECOND SECTION WILL CONTAIN DETAILED STUDIES, PRESENTATIONS, PROJECT REPORTS, ETC.

2. PUBLISH "ENERGY TECHNOLOGY HIGHLIGHTS"
   EACH QUARTER THIS PUBLICATION IS DISTRIBUTED INTERNATIONALLY TO ALL THE PEOPLE WHO ARE DIRECTLY INVOLVED IN ENERGY-RELATED ACTIVITIES. IT TOUCHES ON TIMELY TOPICS ON ENERGY AND TELLS ABOUT WHAT IS GOING ON AT SOME OF OUR COMPANIES AROUND THE WORLD IN ENERGY CONSERVATION. THIS HAS BEEN VERY WELL RECEIVED.
3. DEVELOP AN ENERGY FINANCIAL PAYBACK ANALYSIS
   A COMPUTERIZED FINANCIAL ANALYSIS SYSTEM WAS DEVELOPED TO DETERMINE R.O.I. OF ENERGY-RELATED PROJECTS. THIS SYSTEM TAKES INTO CONSIDERATION THE ENERGY ESCALATION EFFECTS ON A PROJECT, TAX CREDITS IF THEY APPLY AND ANY CHANGES IN OPERATING PARAMETERS THAT RESULT FROM THE PROJECT. IT GIVES THE PERSON WORKING ON A PROJECT A QUICK DETERMINATION OF ITS FINANCIAL FEASIBILITY. THIS MODEL IS UPDATED PERIODICALLY. IT IS BEING USED ACTIVELY BY OUR DOMESTIC COMPANIES AND NOW WE HAVE MADE IT AVAILABLE INTERNATIONALLY.
4. PROVIDE CONSULTATION WORLDWIDE
   THE TAC ACTS AS CONSULTANTS ON ENERGY TECHNOLOGY FOR ALL COMPANIES THAT REQUEST OPINIONS. ENERGY SURVEYS OR AUDITS ARE DONE UPON REQUEST. BECAUSE OF THE TREMENDOUS TIME INVOLVED BY THE NUMEROUS REQUESTS RECEIVED, WE ARE WORKING ON A PROGRAM TO DEVELOP AN INSTRUCTION PROCEDURE TO TRAIN INDIVIDUALS FROM OUR COMPANIES TO DO SELF AUDITS OF THEIR FACILITIES.

5. CONDUCT INTER-COMPANY ENERGY SEMINARS

EACH YEAR THE TAC CONDUCTS AN ENERGY TECHNOLOGY CONFERENCE. THIS CAN TAKE ANY FORM THAT IS DEEMED APPROPRIATE - ALL THE TECHNICAL PEOPLE FROM ALL OUR COMPANIES IN THE U.S. ARE INVITED TO ATTEND. USUALLY THE MEETING IS A 1 1/2 DAY SESSION. NOT ONLY ARE THE ATTENDEES GIVEN INSIGHTS ON NEW TECHNOLOGIES AND FIRSTHAND REPORTS ON SOME OF THE PROJECTS SUCCESSFULLY COMPLETED, BUT IT AFFORDS THE PEOPLE AN EXCELLENT OPPORTUNITY TO MEET THEIR PEERS AND EXCHANGE THOUGHTS AND IDEAS.

THE TECHNICAL ADVISORY COUNCIL FUNCTIONS AS THE NAME IMPLIES. IT IS STRICTLY AN ADVISORY GROUP. THIS FITS IN NICELY WITH THE DECENTRALIZED STRUCTURE OF JOHNSON & JOHNSON. THE INDIVIDUAL COMPANIES MAKE THE FINAL DECISIONS AS TO THE ENERGY PROJECTS BEST SUITED FOR THEM. HOWEVER, THE RECOMMENDATIONS COMING FROM THE TAC CARRY CLOUT BECAUSE OF THE PEOPLE WHO CONSTITUTE THE GROUP AND THE SUCCESSES THAT HAVE BEEN ACHIEVED BY THE COMPANIES WHO HAVE USED THE SUGGESTIONS.

MORE AND MORE OF OUR COMPANIES HAVE TURNED TO THE CORPORATE GROUP FOR BACK-UP SUPPORT FOR SELLING ENERGY-RELATED PROJECTS TO THEIR INDIVIDUAL MANAGEMENTS.

THE ENERGY CLIMATE, AS WE ALL KNOW, IS NOT THE SAME AS IT WAS IN THE EARLY SEVENTIES AND THE LATE SEVENTIES. ONE THING, HOWEVER, IS CERTAIN: ENERGY COSTS ARE HIGH AND THE BOTTOM LINE IS STILL AN IMPORTANT CONSIDERATION. WE AT JOHNSON & JOHNSON TAKE ADVANTAGE FREQUENTLY OF OUR TOP MANAGEMENT'S GENUINE COMMITMENT TO CONSERVE. WE REMIND OUR COMPANIES FROM

TIME TO TIME OF THIS COMMITMENT.

OUR LATEST REMINDER WAS TO HAVE OUR PRESIDENT, DAVID R. CLARE, DECLARE A "JOHNSON & JOHNSON WORLDWIDE ENERGY AWARENESS WEEK." THIS TOOK PLACE THE WEEK OF OCTOBER 17, 1983. THE PROCLAMATION SIGNED BY MR. CLARE WAS CIRCULATED THROUGHOUT THE ORGANIZATION WORLDWIDE.

AS EXPECTED, EACH COMPANY DID ITS OWN THING TO REMIND ALL EMPLOYEES THAT JOHNSON & JOHNSON MUST CONSERVE ENERGY.

THE ENERGY AWARENESS ISSUE MUST BE COMMUNICATED. ALL OF US IN THE INDUSTRIAL SECTOR KNOW THE CONSEQUENCES TO OUR OPERATIONS IF A CRISIS DEVELOPS AGAIN. ARE WE PREPARED TO COPE WITH IT ? IT IS YOUR JOB TO CONVINCE YOUR TOP MANAGEMENTS THAT EMERGENCIES CAN DEVELOP AGAIN AND MOST LIKELY WILL. ULTIMATELY YOU WILL BE HELD ACCOUNTABLE.

I THANK THE ASSOCIATION FOR GIVING ME THIS OPPORTUNITY TO TELL MY STORY AND HOPE WE HAVE GIVEN ALL OF YOU SOME LITTLE THOUGHT TO TAKE AWAY FOR POSSIBLE USE IN YOUR OWN INDIVIDUAL LOCATIONS.

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Distribution and quantitative assessment of world crude-oil reserves and resources

By

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William D. Dietzman[2]

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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CONTENTS

Page

Abstract — 1

Introduction and definitions — 2

Methodology for assessment of crude-oil reserves and their API gravities — 4

Methodology for assessment of Undiscovered Resources of crude oil — 5

Analysis of estimates of reserves of conventional crude oil and their discovery rates — 6

Analysis of the Undiscovered Resources of conventionally recoverable crude oil — 7

Other occurrences of oil resources - extra-heavy crude oil and bitumen — 9

Conclusions — 10

References — 11

ILLUSTRATIONS

Page

Figure 1. Classification of world ultimate crude oil resources ———— 2a

2. Distribution by API gravity of world's Original Reserves of crude oil ———— 4d

3. World crude-oil discovery rate averaged over five year periods ———— 6a

4. Demonstrated reserves of crude oil in 5-year intervals ———— 7a

5. Regional distribution of world crude oil ———— 7b

6. Classification of Original Measured Resources of extra-heavy oil and bitumen ———— 9a

TABLES

Page

Table 1. World estimate of Original Recoverable Resources of conventional crude oil in billions of barrels ———— 4a

Distribution and quantitative assessment of world crude-oil reserves and resources

by

Charles D. Masters, David H. Root, and

William D. Dietzman

ABSTRACT

World Demonstrated Reserves of crude oil are approximately 723 billion barrels of oil (BBO). Cumulative production is 445 BBO and annual production is 20 BBO. Demonstrated Reserves of crude oil have declined over the past 10 years consistent with discoveries lagging production over the same period. The assessment of Undiscovered Resources shows a 90-percent probability that the amount discoverable lies between 321 and 1,417 BBO, 550 BBO being the most likely value. The most likely value for Ultimate recoverable resources is 1,718 BBO. The distribution of Ultimate Resources of crude oil will remain highly skewed toward the Middle East; no frontier areas that have potentials large enough to significantly affect present distribution are recognized. Rates of discovery have continued to decline over the past 20 years even though exploration activity has increased in recent years. Prudence dictates, therefore, that the low side of the assessment of Undiscovered Resources be responsibly considered and that alternate energy sources be a part of future planning.

Extra-heavy oil and bitumen are assessed separately, with Reserves being figured as the annual productive capacity of installed facilities times 25 years. The annual production of extra-heavy oil is about 8 million barrels and of bitumen about 60 million barrels.

INTRODUCTION AND DEFINITIONS

The enumeration of world crude-oil reserves and resources is a difficult undertaking. One must rely on data gathered by others and, through various spot-check and cross-check mechanisms, distinguish the reasonable from the unreasonable. Estimating techniques vary; standards of measurement vary; classification of the reported elements differ; and, in some cases, even the recognition of what is being reported is obfuscated by language and nomenclatural ambiguities. Therefore, to improve world petroleum resource understanding, it is prudent to describe the methodologies and measurement standards explicitly, to disaggregate the data as much as possible to gain insight into the source of the differences, and to standardize the classification and nomenclature scheme to establish unambiguous communication.

The purpose of this report is to give an estimate of world crude-oil resources, their distribution, and their API gravity. The resource classification diagram of the U.S. Geological Survey (USGS) and the U.S. Bureau of Mines (U.S. Geological Survey Circ. 831, 1980) allows for the reporting of both reserves and resources with the degree of geologic certainty of the data expressed on the horizontal axis and the degree of economic potential expressed on the vertical axis. Utilizing this classification format, figure 1 shows the estimate for world Resources of conventional crude oil. By conventional oil, we mean the oil greater than 10° API gravity (excluding natural gas liquids) which is broadly considered to be economically recoverable by conventional primary, water-flood, and pressure-maintenance techniques; the extra-heavy oil (less than 10° API and greater than 10,000 centipoise) of the Orinoco Petroleum Belt of Venezuela and the bitumen of the Athabasca tar sands of Canada, for examples, are not included with conventional crude oil but are listed separately. The resources of crude oil are classified as being Identified or Undiscovered.

The left-half of figure 1 shows Identified (or "Discovered") Resources. Economically recoverable Identified Resources are called Reserves and classified in three subdivisions: Measured Reserves (or Proved, of the U.S. Energy Information Administration (EIA) (DOE/EIA-0216(81), 1982) are defined as the expected recovery, by conventional techniques, considering the full extent of each recognized reservoir; Indicated Reserves (or Indicated Additional as defined by American Petroleum Institute (API, 1980)) are defined as the additional amount of oil that could be recovered given installation of conventional water-flood facilities; and Inferred Reserves are defined as the amount of oil derived from the expected growth in the reported size of fields, given the addition of new pools or reservoir extensions not envisioned in the Measured Reserve calculation. The combination of the Measured and Indicated Reserve is a Demonstrated Reserve. Industry custom prior to 1970 was to report Measured (or Proved) Reserves in the restricted sense of only what had actually received sufficient development drilling to permit reliable flow testing. Since then, however, it has become customary to report an estimate of the maximum expectable conventional recovery from the recognized reservoirs, whether or not they have been completely developed by drilling and whether or not they have been completely fitted for optimum water-flood

RESOURCES OF CRUDE OIL

AREA: WORLD

UNITS: BILLIONS BARRELS

CUMULATIVE PRODUCTION 445	IDENTIFIED RESOURCES		UNDISCOVERED RESOURCES		
	DEMONSTRATED MEASURED INDICATED	INFERRED	PROBABILITY RANGE 95%	MODE	5%
ECONOMIC	RESERVES 723	INFERRED RESERVES NOT ASSESSED	321	550	1,417
MARGINALLY ECONOMIC	MARGINAL RESERVES EACH 1% WORLD AVERAGE RECOVERY INCREASE EQUALS 34	INFERRED MARGINAL RESERVES	—	—	—
SUB-ECONOMIC	DEMONSTRATED SUBECONOMIC RESOURCES 2,267	INFERRED SUBECONOMIC RESOURCES	623	1,068	2,750
OTHER OCCUR-RENCES	EXTRA-HEAVY OIL AND BITUMEN				

Authors: Masters, Root, Dietzman

Date: Identified Resources and production as of 1/1/81
Undiscovered Resources: 3/83

Figure 1.--Shows classification of world ultimate crude oil resources. Subeconomic quantity based on world average conventional recovery of 34%.

recovery. Our definitions and estimates are consistent with current custom and are reported as Demonstrated Reserves. The remainder of the in-place crude oil may be defined as Subeconomic Resources, or if some portion of the remainder is judged to be economic under a specified set of conditions, it can be reported as Marginal Reserves. In effect, when we gain the capability to assess oil deriving from enhanced oil recovery (EOR)--i.e., recovery techniques other than those herein defined as conventional--, the quantities likely will be identified initially as Marginal Reserves; even though there is limited production from EOR, its low level of 81 million barrels of oil per year in the United States and 18 million barrels per year in the rest of the world (Meyer and others, in press) suggests that the activity is still in the pilot-plant stage, so any estimates of potential reserves are premature.

The right side of the classification diagram (fig. 1) shows subdivisions of the Undiscovered Resources based on the same principles as those considered in classifying Identified Resources. The estimate of the economically recoverable Undiscovered Resources is based, broadly, on existing price-cost relationships, and their quantity may be expressed graphically through a full range of probabilities; commonly we report two points on the range encompassing a 90 percent probability of occurrence, as well as the mode or most likely occurrence.

Other Occurrences of oil, which are defined as including both extra-heavy oil and tar sand (bitumen), are referred to at the bottom of figure 1. These resources are set apart from conventional oil at least in part because of their vastly different, technically achievable reserve-to-annual production ratios (R/P). The estimate for Other Occurrences of oil is discussed in a later section.

METHODOLOGY FOR ASSESSMENT OF CRUDE-OIL RESERVES AND THEIR API GRAVITIES

Reserves were estimated by field and aggregated by country and by region (table I). Prime sources of data were the well and field files of Petroconsultants S.A., scientific and trade literature, and government publications. Approximately 80 percent of world reserves, field-by-field, have been specifically examined by W. D. Dietzman and his colleagues with the EIA; they have estimated for each field the Demonstrated oil in place and the Original Reserves. (For an example of one of several publications, see Dietzman and others, 1981.) The weighted-average recovery factor from these studies is 34 percent; this recovery factor includes only the conventional (primary plus water-flood and pressure-maintenance) oil recovery. Approximately 20 percent of the world's known oil is in countries for which adequate field data were not available. In those countries reserves are estimated from available production data and from published national estimates. It is possible that the published estimates of national reserves correspond to a definition of reserves more strict than that used here. We have not compensated for this by adding an extra quantity of oil to these countries but remain mindful of its possible existence.

Table I also shows the distribution of crude oil by API gravity. Data are derived from Meyer (in press), from Petroconsultants S.A., and from personal communication with many interested persons. The aggregate data base is almost complete for most countries, and at the regional level, the data are entirely credible. As shown in figure 2 and table I, 89 percent of conventional world oil is lighter than 25° API gravity: 57 percent lies between 25° and 35° API, and 32 percent is lighter than 35° API. Actually, we have no basis for the specific subdivisions shown; needed is a technical rationale for classification —the data apparently are available.

Table 1.--World Estimate of Original Recoverable Resources of Conventional Crude Oil in Billions of Barrels

	Production	Reserves		Undiscovered recoverable resources Probability range			Ultimate recoverable resources (Mode)
	Cumulative	Demonstrated	Original	95%	Mode	5%	
North America	142.2	62.7	205.6	104	163	322	369
U.S.A.	124.0	29.8	153.8	64	80	105	
Canada	10.1	6.4	16.5	19	26	48	
Mexico	8.1	26.5	34.6	26	50	170	
Other			.7	1	2	8	
Cuba							
Guatemala							
Greenland				1	2	8	
% Original Reserves	10-20°	20-25°	25-35°	>35°			
by avg API gravity:	11	16	37	36			
South America	47.2	34.2	81.5	20	33	69	115
Venezuela	36.1	25.5	61.6	12	17	38	
Other	11.2	8.7	19.9	10	14	28	
Argentina	3.5	2.5	5.9	8	12	26	
Bolivia	.2	<.1	.3				
Brazil	1.2	1.6	2.8				
Chile	.3	.1	.4				
Columbia	2.2	.8	2.9				
Ecuador	.7	2.3	3.0				
Peru	1.2	.9	2.1				
Trinidad	2.0	.5	2.5	1	2	4	
% Original Reserves	10-20°	20-25°	25-35°	>35°			
by avg API gravity:	8	15	63	14			
Europe (less USSR)	11.2	26.5	37.7	13	20	49	58
Western	5.7	24.9	30.6	12	17	40	
U.K.	1.9	14.0	15.9	9	15	34	
Norway	.8	8.8	9.6				
Other(inc.Med)	3.0	2.1	5.2	1	2	10	
Austria	.6	.1	.8				
Denmark	<.1	.3	.3				
Ireland	-	.1	.1				
France	.4	<.1	.5				
W. Germany	1.3	.4	1.7				
Greece	-	.2	.2				
Italy	.3	.4	.6				
Netherlands	.4	.3	.7				
Spain	.1	.1	.2				
Eastern	5.5	1.6	7.1	1	2	4	
Romania	3.9	.9	4.8				
Other	1.6	.7	2.3				
Albania	.2	.2	.4				
Bulgaria	<.1	<.1	.1				
Czechslov.	<.1	<.1	.1				
E. Germany	<.1	<.1	.1				
Hungary	.4	.2	.6				
Poland	.4	<.1	.4				
Yugoslavia	.5	.3	.7				
% Original Reserves	10-20°	20-25°	25-35°	>35°			
by avg API gravity:	2	7	18	73			

Table 1. (continued)

	Production	Reserves		Undiscovered recoverable resources			Ultimate recoverable resources
				Probability range			
	Cumulative	Demonstrated	Original	95%	Mode	5%	(Mode)
U.S.S.R.	67.8	69.8	137.6	59	107	343	245
% Original Reserves	10-20°	20-25°	25-35° >35°				
by avg API gravity:							
Africa	32.1	52.9	85.0	28	46	105	131
Libya)	12.8	24.3	37.1	4	7	25	
Algeria) North	6.4	11.7	18.0	3	5	17	
Egypt) Africa	2.4	4.0	6.3	1	2	12	
Tunisia)	.4	.7	1.1	1	2	9	
Nigeria	8.4	7.9	16.3	2	6	23	
Other	1.7	4.3	6.1	10	21	45	
Angola	.6	.7	1.3	1	3	11	
Cameroon	<.1	.4	.4				
Gabon	.9	.6	1.5				
Ghana	-	<.1	<.1				
Ivory Coast	-	.8	.9				
Congo	.1	.4	.5				
West Sahara				0	0	-	
Morocco	.04	.02	.1	0.1	0.2	2	
Benin	-	<.1	<.1				
Chad	-	1.0	1.0	0.8	3	8	
Sudan	-	2.0	.4	1.6	6	14	
Zaire	<.1	.1	.1				
Niger				0	.1	1	
Mali				0.0	.1	0.5	
Mauritania				0.0	.1	0.5	
Ethiopia				0.1	0.5	2	
Somalia				0.1	2.5	6	
% Original Reserves	10-20°	20-25°	25-35° >35°				
by avg API gravity:	2	3	29 66				
Middle East	123.6	441.7	565.3	72	125	337	690
Saudi Arabia	40.8	170.5	211.3	23	40	109	
Kuwait	20.3	88.6	108.9	1	2	7	
Neutral Zone	3.3	12.6	15.9	1	2	4	
Iran	30.0	63.8	93.8	11	19	51	
Iraq	15.8	50.8	66.6	32	56	150	
Abu Dhabi) Dubai)	7.1	46.5	53.6	3	5	13	
Other	6.3	8.9	15.2	<1	1	4	
Bahrain	.7	.3	1.0	0	0		
Oman	1.5	3.5	5.0	<1	1	4	
Qatar	3.2	3.6	6.8	0	0		
Syria	.6	1.2	1.8				
Israel	<.1	<.1	<.1				
Turkey	.4	.2	.6				
% Original Reserves	10-20°	20-25°	25-35° >35°				
by avg API gravity:	5	3	68 24				

Table 1. (concluded)

	Production	Reserves		Undiscovered recoverable resources			Ultimate recoverable resources (Mode)
				Probability range			
	Cumulative	Demonstrated	Original	95%	Mode	5%	
Asia/Oceania	21.0	34.6	55.6	33	58	176	114
China	6.1	16.3	22.4	14	34	90	
Indonesia	9.4	10.5	19.9	5	9	35	
Other	5.6	7.7	13.3	12	21	34	
Australia	1.6	2.1	3.7	4	6	11	
N.Zealand				.05	.15	.5	
Malaysia	2.2	2.4	4.6				
Brunei							
Thailand		<.1	<.1	tr	1		
Vietnam	-			1	3	8	
Philippines		.2	.2				
Papua N.G.							
Afghanistan							
Pakistan	.1	.5	.6	3	5	9	
India	1.0	2.4	3.4				
Bangladesh							
Burma	.4	.1	.6				
Japan	.2	<.1	.3				
% Original Reserves by avg API gravity:	10-20° 2	20-25° 12	25-35° >35° 45 41				
Antarctica	0	0	0	0	0	19	0
WORLD	445.1	723	1,168	321	550	1,417	1,718
% Original Reserves by avg API gravity:	10-20° 5	20-25° 6	25-35° >35° 57 32				

Authors: Masters, C. D., Root, D. H.,
Dietzman, W. D.

Date: Reserves and production as of 1/1/81
Resources as of 3/83

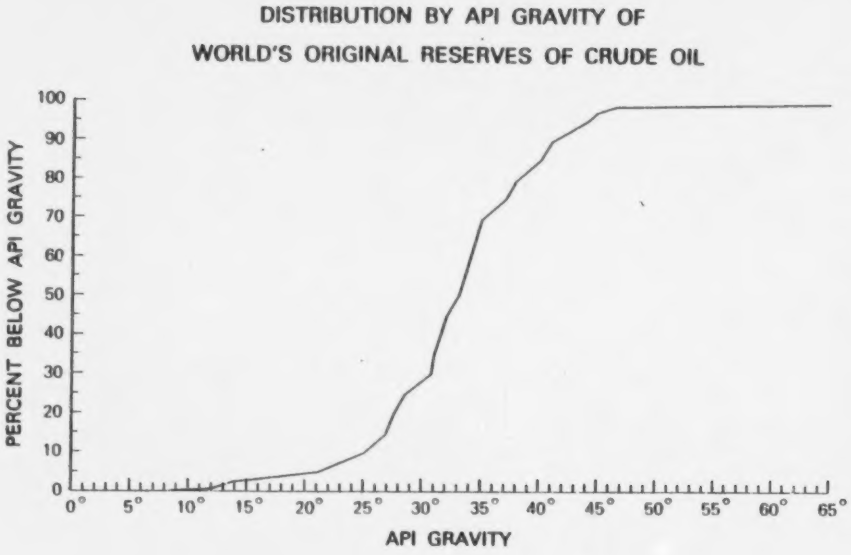


Figure 2.--Distribution by API gravity of world's Original Reserves of crude oil. (API gravity = 141.5/specific gravity - 131.5).

METHODOLOGY FOR ASSESSMENT OF UNDISCOVERED RESOURCES OF CRUDE OIL

Undiscovered economically recoverable resources of crude oil (table I) were assessed for this study by utilizing the techniques employed by the USGS for domestic petroleum assessment (Dolton and others, 1981). In general, the intent is to estimate economically recoverable resources, but in the case of very deep water and of Arctic/Antarctic ice conditions, we have assumed eventual economic recovery for large-field occurrence, even though technical capability may not yet be demonstrated.

The assessment technique requires study of a given area, paying particular attention to the geologic factors controlling the occurrence, quality, and quantity of the petroleum resource. Standardization of critical elements of the investigations is achieved by the preparation of data forms for each basin that call for specific volumetric, areal, and rock-quality measurements, as well as the determination of basin analogues for comparison. In addition, finding-rate histories and projections are constructed whenever possible. The absence in some areas of reliable dry-hole data is a problem that unquestionably weakens the assessment process and may result in a high-side bias to the assessment. From these data and analyses, a set of resource numbers is calculated by making volumetric comparisons with different analogue basins, by projecting discovery and production curves, and/or by play analysis.

The assessment process itself is subjective; the results of the geological investigation and of the resource calculations are presented to a team of USGS assessment specialists (in this case, a team of 10 to 12 scientists, each on average having about 20 years of petroleum studies experience), each of whom makes his personal estimates conditional upon economically recoverable resources being present. Initial assessments are made for each of the assessed provinces as follows:

(a) A low-resource estimate corresponding to a 95 percent probability of more than that amount

(b) A high-resource estimate corresponding to a 5 percent probability of more than that amount

(c) A modal (most likely) estimate of the quantity of the resource associated with the greatest likelihood of occurrence

The individual estimates are then posted and averaged and the results debated from the perspectives of the personal experiences of the individual assessors. A second and third iteration of the procedure may follow depending on consensus. If no commercial oil has yet been discovered in the basin, a marginal probability is subjectively assessed to record the probability of any commercial oil being present. The results of the final estimates are averaged, and the numbers are computer-processed using probabilistic methodology (Crovelli, 1983) to show graphically the range of the economically recoverable resource values.

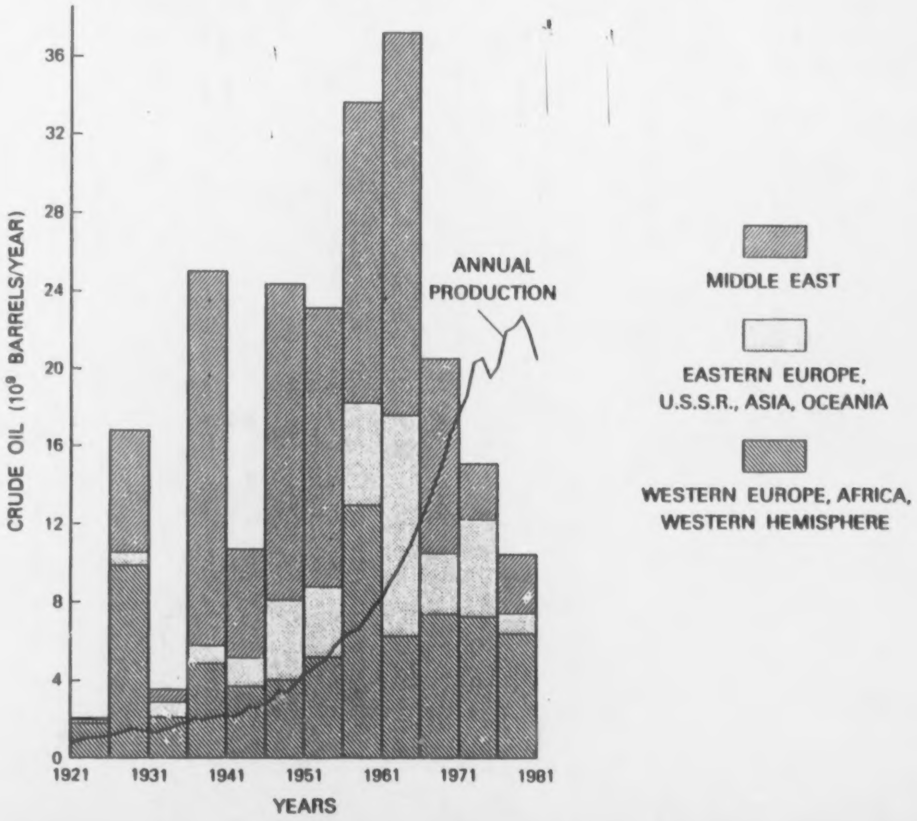
Approximately 90 percent of the world's undiscovered resources of crude oil were assessed in this way over a period of about 3 years utilizing approximately 18 man-years. (For an example of one of several publications, see Masters and others, 1982.) Many small basins, or those considered after preliminary examination to have limited petroleum potential, were assessed on the basis of exploration or production projections or by cursory volumetric and analogue determinations. In our judgment, no area having significant crude-oil potential remains unassessed at this stage of data development and availability.

ANALYSIS OF ESTIMATES OF RESERVES OF CONVENTIONAL CRUDE OIL AND THEIR DISCOVERY RATES

Because reserves by definition are economic and because economics varies with the perspective of the operator, unavoidable inconsistencies exist in reserves reporting. Some world reserves estimates, however, appear to be clearly too low and others arguably too high. That the series of numbers reported, for example, in the API Basic Petroleum Data Book (API, 1981) is likely too low is evidenced by the following analysis: 1) The amounts of oil discovered over the past 10 years, as reported for this study (fig. 3) or by Exxon (1982), are considerably less than the amounts of oil produced over the same period. We show the differential to be about 80 BBO over the 10-year period, whereas Exxon shows it to be about 60 BBO. Whichever data set proves to be most nearly correct, there would seem to have been a deficit for the 10-year period of about 70 BBO. 2) During this same period, the reserves reported in the API Basic Petroleum Data Book did not decline but rather increased by about 41 BBO. 3) Reserves, therefore, must have been larger than stated or they grew, through additions from the Inferred Reserves, by at least 111 BBO. The conundrum is how much longer we will be able to reevaluate upwards because of improved recovery practices or because of new pools and unpredicted field extensions (Inferred Reserves) enlarging the Demonstrated Reserve. On a smaller scale, in the United States during the last 10 years, production exceeded discoveries by more than 22 BBO, yet reported reserves declined by only about 12 BBO. A possible explanation for this lies in the USGS estimate of 23 BBO of Inferred Reserves (Dolton and others, 1981). The United States clearly is the most extensively explored and developed region in the world, yet the data show the need for revisions of the reserves reporting, year-by-year, on the order of 1 BBO, or one-third of our annual production. It is important for us to learn where that oil is coming from because some day that cushion is going to be exhausted; it is equally important, for the same reasons, that we establish, on the world scale, a known relationship between discovery, production, and reserves.

Contrariwise, some reserve numbers appear to us, definitionally, to be too high, because the authors assumed 40 percent average conventional recovery (Halbouty and Moody, 1979). When account is taken of the higher assumed recovery factors, however, the estimates of these particular authors are approximately consistent overall with those in table I.

Figure 3. WORLD CRUDE-OIL DISCOVERY RATE AVERAGED OVER FIVE YEAR PERIODS



Four years ago, Halbouty and Moody (1979) reported a modest decline in reserves over the previous decade; we concur with their findings and with the continuation of that trend (fig. 4). We also concur with their findings, and those of Exxon (1982), of a declining discovery rate now extending over 2 decades. Our data, however, show an even sharper decline (fig. 3); we are conscious of the possibility that additions from Inferred Reserves might enlarge the reserves estimates of the discoveries of the past 5 or 10 years but would suggest that, for reasons described above, those additions may be modest.

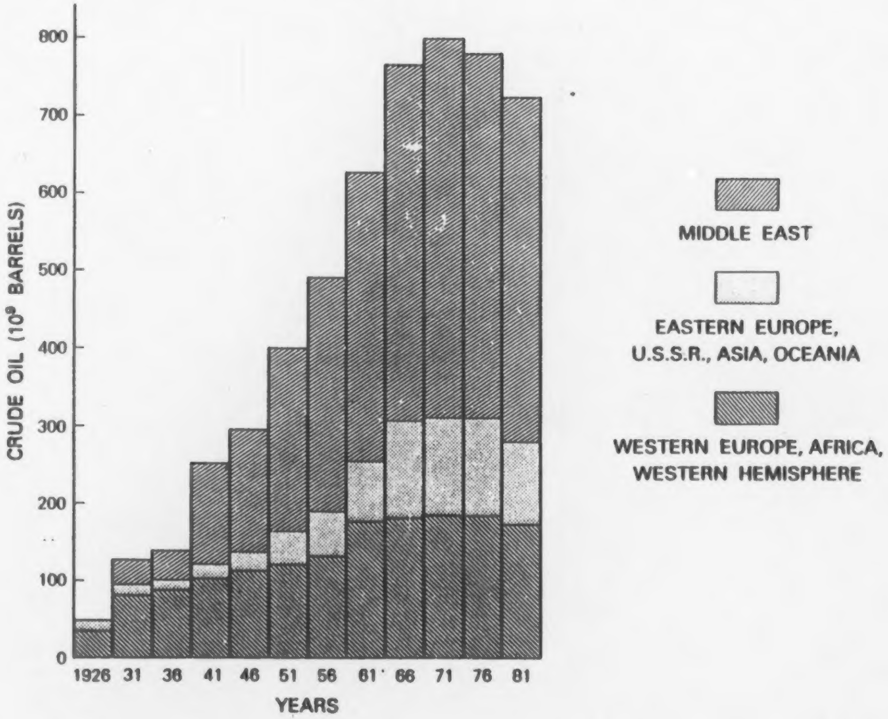
The elements of accurate reserves reporting appear to be within our grasp. In a few countries, understanding of definitions and availability of public data for independent analysis are still lacking, but overall we are confident that these estimates are proportionally and geographically satisfactory. Specifically unaccounted for is an unassessed quantity of Indicated Reserves, as described above, along with some Inferred Reserves in the form of new pools and unpredicted extensions of known reservoirs; we believe the quantities unaccounted for can be no more than a few percent of the total and likely could be assessed statistically, given greater certainty in production and discovery data.

ANALYSIS OF THE UNDISCOVERED RESOURCES OF CONVENTIONALLY RECOVERABLE CRUDE OIL

Our assessment of the world potential for Undiscovered Resources of conventionally recoverable crude oil indicates a 90 percent probability that the value lies between 321 and 1,417 BBO, with a most likely (modal) value being 550 BBO (table I). Our assessment (95 percent to 5 percent probability range) falls inside the range (90 percent to 10 percent probability range) assessed by Halbouty and Moody (1979) for the Tenth World Petroleum Congress of 280 to 2,415 BBO, and our modal value is significantly less than their expected value of 987 BBO. Whereas comparison of the estimates by region (fig. 5 of this paper and table 4 of Halbouty and Moody, 1979) discloses remarkable similarities in the modal assessments of the United States and of the Middle East, the other world subdivisions show considerable differences. Because the areas corresponding to the assessments are not the same, however, it is not possible to be precise about where all the differences lie. Nehring (1982) has recently published a disaggregated reserve and resource analysis with which we find we are in substantial agreement, both with respect to total numbers and to regional distribution of crude oil. Because of reporting differences, however, a dialogue is nonetheless required to ascertain the conceptual differences between oil additions deriving from discovery as opposed to oil additions deriving from increased recovery.

A further difference between the assessment provided to the Tenth World Petroleum Congress and this assessment lies in the high-side values which differ by a factor of almost two. Our view at this point is that world data are fully adequate to support a relatively narrower range of resource

Figure 4.--DEMONSTRATED RESERVES OF CRUDE OIL IN 5-YEAR INTERVALS



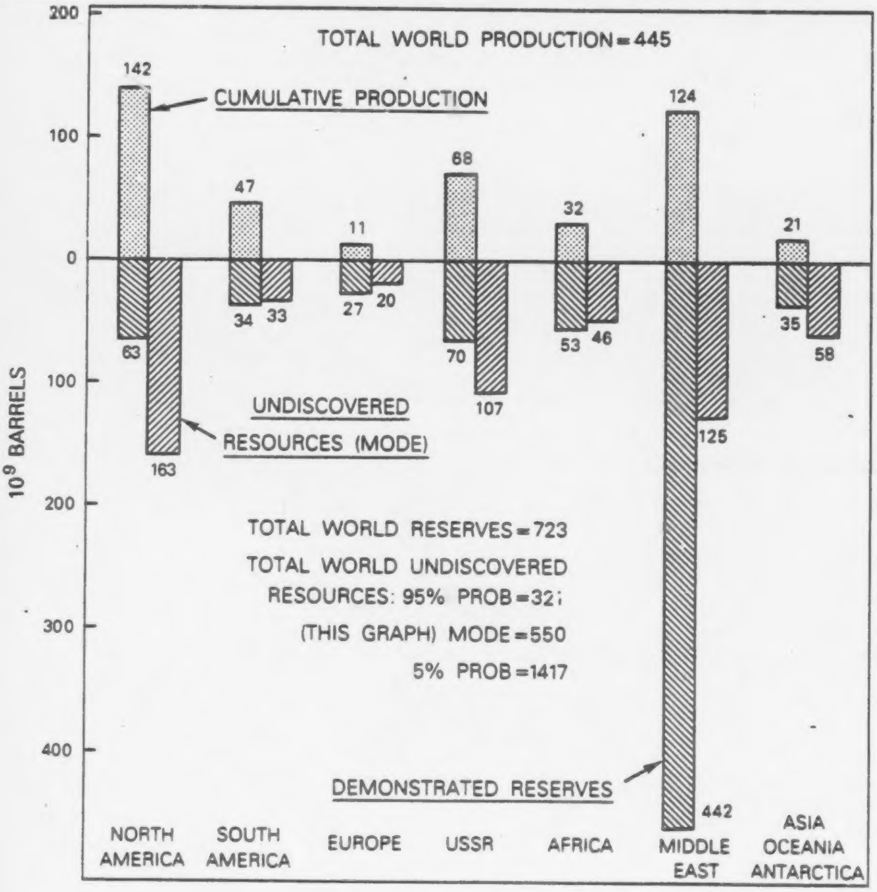


Figure 5.-- REGIONAL DISTRIBUTION OF WORLD CRUDE OIL

estimates. To achieve the higher of the two assessments, a discovery of the dimensions of another Middle East province clearly must be considered, and our studies indicate no possibility for such an occurrence.

The low-side assessments, on the other hand, remain essentially identical. They, of course, reflect the potential of relatively well known provinces, and the assessment process has, in this case, the advantage of more complete information.

For our modal assessment of 550 BBO of Undiscovered Resources to be sustained, a massive amount of exploration is still required. We have not completed the studies of trends of finding-rate efficiencies, but our general perception is that numbers of exploratory wells are increasing yet discoveries are declining; hence exploration efficiency is also declining. Needed to reverse that decline is the discovery of new major provinces (ultimate resources in excess of 20 BBO or 1-year's production for the world), or significant discovery increases in the giant Middle East province or in others of the identified petroleum-favorable regions of the world. Our analysis suggests the likelihood that most of the new oil will come from the established provinces, but the unknown of the Arctic, deep water, and other frontier areas always must remain a consideration.

In attempting to address the issue of contributions of frontier basins to new oil discovery, we tried to analyze the often repeated notion that there are a certain significant number of still untested basins. We have not yet completed the work to permit a comprehensive statement, but we can note that most of these basins are untested for good geologic or economic reasons. In particular, we examined the Arctic region for clues to the prediction of undiscovered major provinces. The region is so big that it is awkward to downgrade almost any part for lack of favorable oil characteristics. However, we do not think that the evidence is encouraging, for example, for any significant extension under the Barents Sea of the highly favorable Devonian source rock of the Volga Urals basin or the mature Jurassic source rock of the North Sea basin; in all other areas of the Arctic, likewise, there does not appear to be that combination of geologic factors necessary for truly large oil occurrence. On the basis of area and volume alone, a significant amount of oil must be assessed for the Arctic, but we see little possibility there for the discovery of a major province. In addition, the Arctic poses logistic and environmental problems that necessarily will deter commercial development.

The deep-water areas remain poorly known. Although an attempt was made to extend geologic understanding of coastal regions out to a water depth of 2,500 m, we must acknowledge inconsistency in this effort. Certainly, data become sparse in deep-water regions, but in most areas we also judge that the merit of the petroleum geology declines as well.

Our still limited understanding of China reflects, in part, only the time constraints for preparation of this paper. There is much published literature to be digested and vast minimally drilled areas to be tested. Nonetheless, it has been possible to develop a broad, general understanding of China's petroleum geology sufficient to render a credible assessment (table I). Published regional analyses are excellent, and sufficient quantitative data are available to begin to get an idea of their reserves, the dimension of their basins, and various other specific petroleum geology parameters. The most critical data still missing are drilling results to permit exploration-maturity analysis.

OTHER OCCURRENCES OF OIL RESOURCES - EXTRA-HEAVY CRUDE OIL AND BITUMEN

Though large quantities of extra-heavy crude oil and bitumen are known in various parts of the world (Meyer and others, in press), these commodities are not at present serious economic contenders in the market. We suggest, therefore, that the issue is not how much is in the ground but rather how much can be produced. Considering that production facilities have a finite service life, we define reserves as the amount of oil that can be produced over a 25-year period given installed production facilities; the otherwise recoverable resources are classified as Marginal Reserves; the remainder of the in-place resources, considering approximately a 10-percent recovery factor, is shown as Subeconomic Resources (fig. 6). Though considerable quantities of bitumen are available in different parts of the world, only in Canada, from the Athabasca tar sands, is a major extraction effort underway--now producing approximately 60 million barrels/yr. The overwhelmingly dominant resource of extra-heavy oil is in the Orinoco heavy-oil belt of Venezuela; on a pilot-plant basis, some 3 million barrels are being produced. Elsewhere in the world, annual production of 3 million barrels is also being achieved in Italy and 1 million barrels/yr is being produced in both the United States and in Mexico, for a total extra-heavy-oil production of 8 million barrels/yr. Extra-heavy oil and bitumen cannot contend economically with conventional crude oil, but their presence in large quantities in various parts of the world assures mankind of the essentially limitless availability of naturally occurring oil.

ORIGINAL MEASURED RESOURCES OF EXTRA-HEAVY OIL AND BITUMEN

AREA: WORLD UNITS: Billions Barrels

CUMULATIVE PRODUCTION	EXTRA-HEAVY OIL	0.227
	BITUMEN	0.427
RESERVES	EXTRA-HEAVY OIL	0.2
	BITUMEN	1.5
MARGINAL RESERVES	EXTRA-HEAVY OIL	59
	BITUMEN	172
SUBECONOMIC RESOURCES	EXTRA-HEAVY OIL	500
	BITUMEN	1,500

AUTHOR: Meyer, R. F. DATE: 1983

Figure 6.—Classification of Original Measured Resources of extra-heavy oil and bitumen.

CONCLUSIONS

There is an immense quantity of conventional crude oil in the world; our capacity for consumption, however, is perfectly capable of challenging that immensity. Though there is much yet to be discovered and produced, there is no room for complacency. The slack is coming out of reserves estimates, and to the extent that discoveries remain less than production, world Demonstrated Reserves, as defined herein, will continue to decline. Even if EOR and the production of extra-heavy oil and bitumen become ubiquitous reality, they are unlikely to achieve rates of production even close to matching those of primary and secondary recovery in the past; the resulting patterns of consumption of crude oil in the decades ahead, then, will be quite different.

The distribution of crude oil remains restricted, and there is little chance that that condition will change (fig. 5). The Middle East region dominates known world petroleum occurrence, and we judge it still to be the richest hunting ground. Even though most of the world's oil will continue to be supplied from traditional areas, exciting discoveries of great local significance will be made in many other areas of the world. However, one should not anticipate riches from so-called untested areas just because exploration activity has not been obvious.

A further concern about estimates of world petroleum availability is the present limited discovery rate relative to production. Without evaluating in detail the geology of all exploration activity, the general level of exploration, as measured by numbers of wells, has increased over time, yet annual discoveries are declining, suggesting the possible reality of low-side assessments. If the low side be reality, the need for alternate energy sources becomes increasingly critical for most of the world's countries.

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Senator **Warner**. Thank you very much.

We'll now have Ambassador Eilts.

My colleague and I would be very much interested in a sketch of your background.

Senator **Metzenbaum**. You were Ambassador to Egypt.

Ambassador **Eilts**. That's right, to Egypt and before that to Saudi Arabia. I spent 35 years in the Foreign Service in the Middle East and a very considerable portion of it dealing with the Arabian Peninsula, the gulf, Iran, Iraq, am now retired from the Foreign Service and am a university professor at Boston University.

Senator **Warner**. Still actively providing us with the wisdom and experiences that you've gained.

Ambassador **Eilts**. I would hope so, sir.

Senator **Metzenbaum**. I don't mean negative in this question, but is the program, you administer a program at Boston University?

Ambassador **Eilts**. Yes, it is.

Senator **Metzenbaum**. Is that a program funded by the Arabs?

Ambassador **Eilts**. No, not at all.

Senator **Metzenbaum**. I knew there were some up in that area that were and I didn't mean to be at all——

Ambassador **Eilts**. There isn't a single dollar of Arab money in it.

Senator **Metzenbaum**. Please understand I do not mean by my question in any way to be accusatory nor to be a reflection on your integrity, but I did think it had some relevance and I appreciate your candidness.

STATEMENT OF AMBASSADOR HERMANN F. EILTS, DIRECTOR, CENTER FOR INTERNATIONAL RELATIONS, BOSTON UNIVERSITY

Ambassador **Eilts**. Mr. Chairman, my role here is to suggest some practical steps that we ought to be taking at the present time to try to protect the availability of oil, Middle East oil resources.

I have no quarrel whatsoever with the analysis that has already been made of the gulf oil and also the threat to it. I, too, share the view that probably some time in the next year, probably earlier rather than later, we may very well face some sort of a disturbance in the gulf that would either for a shorter or for a longer period of time disrupt the oil flow through the Strait of Hormuz.

Now it's in connection with that worry that I focus largely on the gulf problem, but I would like to initially just make one statement that addresses itself to the broader problem. I do get the impression in recent times that there is so much focus on the gulf, and there is so much focus on Lebanon, that we sometimes forget there are other elements in the Middle East that could cause a disruption of Middle East oil to the United States and to our European and Japanese allies. It may not be as imminent, but it is constantly there. What I have in mind is what had for a long period of time struck me as a stagnant Middle East peace process. It is certainly true that every Arab leader in the gulf states, including in the oil producing states, is today much more responsible when he speaks of the oil weapon or the nonuse of the oil weapon. But what has struck me sir, in frequent visits to the Middle East as a whole, including within the last few months, is the continued widespread belief among the publics of all of the Arab States that I have visited that the oil weapon should be used, and that it should be used against the United States because of what is perceived to be a skewed American policy to the Arab-Israeli problem.

So long as there are threats from elsewhere to the Arab States, and particularly from Iran, the leaders of the states, the oil producing states and those friendly to us can withstand such public pressures. However, I'm constantly reminded, Sir, that in 1967, the then King of Saudi Arabia, King Faisal, who was a close friend of the United States, found that he had to bow to the pressures of his own public and the pressures of his own military and had to impose an oil embargo when the June war took place. He indeed imposed it late in that conflict, not at the beginning. It was not an automatic action, but it was eventually imposed because of domestic pressures that were put upon him.

I do think we should constantly bear in mind as we think about the threats to the Strait of Hormuz, that other broad scale Arab-Israeli war, caused by whatever group or groups, is certain to bring the kind of public pressures and perhaps military pressures to bear upon the leaderships, including the leaderships of some of the Arab states that are most friendly to us, that they would find it difficult to resist. I would hope that in any war, broad Arab disruption of oil supplies would not occur. But to me it is essential, if it is to be avoided, that we not only work on Lebanon, or only in the gulf area, but that somehow we revive the broader Middle East peace process.

That may take a long period of time to implement, yes, but that doesn't matter. What is lost when a peace process, an overall peace process is long stagnant, is the element of momentum, the willingness to give the benefit of the doubt that a mutual desire for peace exists and to provide moral assistance to the leadership of the Middle East countries in enabling them to cope with anti-American elements in these countries. Thus, while I too want to focus a bit more on the gulf, I do want to point that we should not forget the continued importance of an overall Middle East peace process in the protection of our oil interest.

Now, sir, a number of things have struck me in my recent visits to the gulf, and they all have to do in one way or another with the Iraq-Iranian war and the possibility, indeed many believe the probability, that Iran will seek to mine or block the Strait of Hormuz.

Three elements come up in particular. They were repeated to me constantly up and down the gulf during the last 2 months. One is the notion, it's a little bit mad to be sure, but it's the notion that has persisted for the last 3 years, that it is the United States that was somehow responsible for the Iraqi action against Iran and that the United States that has done so with ulterior motives. Therefore, it is the United States, if it only wishes to do so, that has the capability to bring that war to an end.

I said a few moments ago that this is a bit of madness, a local perception, but, regrettably, so many things in the Middle East are based on perceptions rather than realities.

A second element that came up constantly was the deep concern on the part of all the Arab governments of the gulf over the possibility of Iranian inspired subversion and the reluctance on their part to admit that they would have difficulty in coping with it.

And the third, equally important and one to which I referred earlier in a slightly different fashion, the question of whether the Reagan administration really means it when it says that in the event of an Iranian effort to close the Straits of Iran, it would take whatever action is needed, including military action, to keep those straits open. That question was a nagging one that everyone asked.

All of these questions suggest to me that our communication with the states of the gulf is perhaps not as good as it ought to be. Granted there is a residual suspicion going back to the overall Arab-Israeli problem, nevertheless, we share at the moment, and there is a readiness to admit this on the part of most gulf leaders, a mutuality of interest such as we haven't had for a long time. To me, this means we've got to find ways and means of improving our dialog with the gulf states.

We have depended in large measure in the past upon Saudi Arabia. This is perfectly wise, but I wonder if it's still enough. The Saudis are simply one element of the gulf, an important area to be sure, but one which is looked upon with some element of uncertainty by some of the other states of the gulf. The religious fundamentalism that Saudi Arabia represents is a source of worry to some of its neighbors, even though they are all cooperating at the moment in the Gulf Confederation Council.

I would suggest, sir, that while we have very little capability at this point in time to do very much to end the Iraq-Iran war, there are some things that we could do to strengthen our position.

First, I would suggest that we ought to send an Ambassador again, as quickly as possible, to Kuwait and even to Iraq. Assuming that the Government of Iraq does not want to have full diplomatic relations, there are procedures in the diplomatic lexicon such as we have used with China whereby an organization, an office that is simply called a liaison office, can be headed by an ambassador.

In the case of Kuwait, I share the view that I'm sure all of you do, that what the Kuwaiti Government did with respect to the nomination of the previous American Ambassador was highly regrettable. I think it was a mistake on their part. I think they, too, realized it was a mistake. But I do think, given the importance of the gulf, given the possibility that we may have a problem in the Straits of Hormuz, that the time may have come to swallow our pride and arrange to send an ambassador back there, we must also insure that our entire array of ambassadors in the gulf states are of very high caliber. More than that, we should insure that that array of Ambassadors in the gulf have access not only to departmental desk officers and Assistant Secretaries of State, but to the highest levels of our Government. This is important to the credibility of our Ambassador in that region. If the Ambassador can say that he has seen the President of the United States, that he has talked with the President of the United States, and that he had direct instructions from the President or the Secretary of State, this gives an element of credibility that is absent when it is believed he's simply someone from the general Foreign Service.

Related to this, I would suggest that we have for too long neglected some of the gulf states in terms of high level visits. We have not had anything above an Assistant Secretary of State visit Abu Dhabi, Kuwait, Qatar, Bahrain, or the others for a long period of time. We have sent officers of the Assistant Secretary level. That's fair enough, but again, given the possible criticality of the gulf in the year ahead, given the fact that there is going to be a growing need for close American cooperation with the Arab States of the gulf, it seems to me that the time has come to send some of our higher level officials to those states for brief visits of 4 to 5 days. I know that they are busy people. I know that their schedules are full. But the gulf is a critical matter and it does seem to me that we have neglected, not just this administration, but previous administrations as well, doing a number of simple things in that area which would buttress our posture there.

Thank you.

Senator **Warner**. Thank you, Ambassador Eilts. And I thank each of the members of the panel. It's been a very helpful discussion.

I'd like to observe at this point that the years that I've served on this committee, there's always the presence of our late colleague, distinguished Senator Jackson, this particular hearing is one I think that he originated when he was chairman of this committee, and his presence is missed today. Of course we have his successor, Mr. Evans, and I think he will join me, that this one hearing that he felt most significant to initiate the responsibility to this committee and we miss him dearly.

In the past 3 weeks I have had the privilege of visiting the Middle East with the chairman of the Armed Services Committee, and we saw the President of Lebanon, Mr. Gemayel; the Prime Minister of Israel, Hussein; and a trip into Syria. Putting aside the Syrian visit, all of the heads of state, the governments that we consulted with, contrasted the level of terrorism, the threat of terrorism today to the oil supply, the energy supply in that area in far stronger terms than I had received in years previous when I visited that area. I noted an absence, particularly from you, Mr. Cordesman, and you Ambassador Eilts, of any reference to the heightened risk of terrorists to the flow of energy from that part of the world. And perhaps you could start off with that.

Mr. **Cordesman**. Yes, I have commented in detail in the prepared comments that I prepared for the record. There is a very definite increase and there is an increase on several grounds. Partly it is a split between Sunni and Shi'ites. The Shi'ites traditionally in many countries have been a class which have been denied their educational opportunities, they've been denied economic opportunities, they have been if not outcast people who have been structured to within an inferior position in society. This is a group most of which now I think now is well under 13 years of age. Extraordinarily young population.

In general, the population of the gulf, more than half of it is under 15 years of age. The incredible expansion of education in the region has changed values. Often rather nominously. It's given people an education but it has not given them a place in society.

Now today we are already beginning to see an expansion in efforts by Iran where for religious reasons to train—I hate to use the word terrorists because they are political activists, they are religious activists they are subversives, and yes they are terrorists as well. But the other three activities in the long run may be more damaging to the West's interests than those of our friends in the region, than those of terrorists.

There are arms pouring into the area. Everybody shows the stacks of arms they've captured. What they don't show are the ones which are now beginning to appear in virtually every village. There is like the—of for example Turkey, Iraq and Iran. Arms and explosives are widespread throughout the region. On the eastern border of Iran there are arms throughout the area, and Syria. We are seeing in Lebanon one of the most heavily armed states on a personal level in history, and we have seen the results.

Now this kind of terrorism I think is something which now cannot be capped. We will see this threat grow for at least the next 10 years and it won't simply be today's threat from Iran which is already beginning to bridge from the gulf to the Arab-Israeli confrontation and create one wide spread regional crisis, not simply isolated islands of terrorism versus given national regimes. So I think this is an extremely serious and uncontrollable problem.

Senator **WARNER**. Given that background, could you describe, if you possess the knowledge, on how that type of movement would hit say less than a dozen central points and interrupt the flow of energy from that part of the world. I'm talking about the pipelines, cargo terminals, import-export. Have you made an analysis of that?

Mr. **CORDESMAN**. Yes, I have in a forthcoming study. But the end result I think would be today's terrorist could get at certain key facilities but not make a major interruption in facilities. Unfortunately the major concentrations of pumping and shipping capability in Saudi Arabia have gone up in such a way that liquid gas facilities are layered over crude oil facilities. To this day they still do not have effective firefighting capabilities. I think the congressional research staff has done a very good job of analyzing this. Particularly the facilities on the coast, extremely vulnerable to even such things as light antitank guided missiles. It would be impossible for anyone to analyze what the effect would be of a properly placed missile, but that is simply one facility. I think there is one other in the UAE which is equally critical. The others would require these very well organized and concentrated terrorist attack.

In general, the greatest protection against terrorism is always the incompetence and inability to plan from the terrorists. The vulnerability exists but historically we've been very fortunate that we have not dealt with very well organized and armed terrorists.

Senator **WARNER**. Thank you. Ambassador Eilts, do you have a view on this?

Ambassador **EILTS**. Yes sir. I did mention the constant question of subversions and the uncertainty on the part of local leaders as to whether their security services could cope. That's certainly a very definite worry. I'm not entirely sure that any of them, except perhaps Iraq, are really likely to be very effective against subversive terrorists. I would suggest, sir, that perhaps some consideration ought to be given to altering the congressional ban that was imposed some years ago on some kind of police assistance to some of the regimes of that period. Selective assistance, perhaps in the counter subversion area would help them to meet that threat that they now do not have the capability of dealing with. There is, of course, the constant practice in the area that, once things are quiet for a period of time, laxity set in until the next explosion. The latter we can't easily overcome, but perhaps we could help with first.

Senator **Metzenbaum**. Mr. Cordesman, the President has said "I do not believe the Free World would stand by and allow anyone to close the Strait of Hormuz." My question to you is, is the United States effectively in a position to do much about that? Although I recognize the difficulties of trying to close the Strait of Hormuz because it's a large body. You don't do it by just sinking one ship. You do it by frightening Lloyds of London out of providing insurance. But other than that, and perhaps using some mine sweepers, how do you analyze that situation vis-a-vis closing the Strait of Hormuz and our Nation's ability: A, to have an impact upon the Iran-Iraqi war; and B, to have an impact upon closing the straits?

Mr. **Cordesman**. First Senator, if I'm going to make a point there's far too much emphasis on the straits. It's like taking a glass bottle and saying you can only break it at the neck. The straits have fairly strong currents and I'm sure you've been briefed on the mining problems of actually mining the straits closed. But it's a fairly simple proposition to let free mines go anywhere in the gulf. The probabilities of hitting a given tanker are very low, but these mines as we've already seen can exist there for months and be anonymous as to where they came from in the first place.

How many risks will a given tanker captain take if Iran or Iraq were to release several thousand mines simply floating under the water in the straits? Could we sweep those mines? No, we could not. We have our greatest military potential near the straits and we are dealing with the most conventional threat. The threat would be Iranian ships. I believe we certainly have the capability to take the Iranian Navy out in one or two strikes in a day or two.

There is perhaps one or two major air facilities. They are down to something like 20 to 25 F-4's and a fairly large number of F-5's. I suspect if they launch the kind of suicide attack that they have practiced they could in fact take out a U.S. ship that moved into the area, but we might well be able to interdict on any air bases within the range of the straits before we would have to place a target into harm's way. We do have allies in the area. Britain has been in the area before.

The problem lies not simply in the straits, it lies in a country like—UAE, without effective air defenses or forces. We don't have the ability to cover that area with our AWAC's or fighters without considerably more preparation than we have now. We have the same problem with Kuwait. We have the problem with Bahrain and Qatar. There and the rest of the gulf the United States has exceedingly limited capability, yet these countries have very large Shi'ite populations, and already have had serious internal security problems.

So the answer is from a purely military sense in the straits, we have great capability. The trouble is the rest of the glass bottle where our capabilities may not be appropriate and are relatively limited.

Senator METZENBAUM. Mr. Conant, the oil industry opposes the matter of mandatory allocation of all oil resources in this country. Am I correct in that? Do you know?

Dr. CONANT. Yes, they very much prefer the administration's current view.

Senator METZENBAUM. And the reason, if you know?

Dr. CONANT. I think it stems really from two causes. The first is perception of the American industry, felt they were injured unnecessarily, severely. The kinds of policies that were adopted following the 1973, 1974 war. A much larger cause I think is the general sense on the part of the industry that it has the capability to deal with shortfalls and that rather than run the risk of greater government involvement in their business, they think they can cope.

Senator METZENBAUM. Do you have an opinion as to whether this nation ought to have a mandatory allocation program in the event of a shortage?

Dr. CONANT. My understanding is they do not think that necessary.

Senator METZENBAUM. I said do you have an opinion?

Dr. CONANT. Oh yes, indeed. Having lived through part of that 1973, 1974 war, I understand what Senator McClure is saying by the use of the telecom. I think this country to be prudent must have a generally agreed upon equitable means of assuring supply in the best of our Government's ability and hence your efforts and those of other Senators, and I support totally.

Senator METZENBAUM. Thank you.

Ambassador, you mentioned the possibility of the oil weapon being used by some of the Arab nations. How effective do you think that would be in view of the world surplus of oil and secondly, would it not be self-defeating since so many of the Arab nations have built up their economic demands to a point where they need the resources that flow from the sale of their oil?

Ambassador EILTS. Senator, I agree with the thrust of both of your questions here. I do not think it will be effective. I do not think that it is something that the leaderships of most Arab states would favor. They do, in most instances, recognize that it is self-defeating at a time when there is a surplus of oil, at a time when they need their oil revenues more than ever before. For example, the Gulf States are financing not only their own internal development programs, which are massive, but also financing Iraq and trying to undertake foreign assistance programs of their own. They need the money. So there would certainly be a strong built-in opposition to any effort to persuade them to use the oil weapon.

All I meant to suggest in my comments, sir; was that the views of the mass of the population, to the extent one can measure it, is that the oil weapon be used. If you take the university students, if you take the civil servants, up to the middle level, if you take individual businessmen, there are frequently contradictory set of values. On the one hand, they know they need the oil income. On the other hand, there is a sense of frustration. They want to use the oil weapon simply to punish the United States, the Dutch, the Norwegians and a few others and let the consequences be hanged.

I did not mean to suggest that I believe this is iminent or likely in the immediate future. I simply wanted to remind ourselves that the oil weapon, which we've all come to accept or assume is no longer an important element, is still something that is favored by very, very many people in the Middle East populace. They may not be thinking rationally, but only emotionally. Unfortunately, the Middle East acts on the basis of emotion all too frequently.

Senator METZENBAUM. There are few men in the country who have had the experience that you've had in the Middle East, and the question I'm about to ask you calls upon that experience and knowledge and ability.

Assume for the moment that Saudi Arabia, Morrocco, one of the more moderate states, perhaps even Jordan, knew that its administration, its government, its leadership, it as a country was being endangered. Did you ever envision the situation where one of those Arab states would turn to Israel for assistance to prevent an outsider such as Syria overrunning Saudi Arabia or whatever?

Ambassador EILTS. Sir, I think that is a long way off. I do not in the immediate future perceive that. Perhaps the country that would be most willing to deal with perhaps seeking Israeli assistance, not in terms of military units but in terms of security assistance, would be Morocco; I think it's worth bearing in mind that in the peace process it was the Moroccan government that did a great deal in urging the late President Sadat of the desirability of talks with Israel. As for Saudi Arabia, no sir, I do not see it in the near future nor would I see it in the case of Kuwait. As one gets down the gulf, into the lower part of the gulf, there is a greater desire, at least on the governmental level, for getting the Arab-Israeli issue out of the way, Oman for example. One could conceive of certain circumstances where this might be possible, but then only if it is in close association with the other GCC states.

Senator METZENBAUM. What about Jordan?

Ambassador EILTS. I would doubt it, sir. It is possible that if some kind of peace could be arranged between Jordan and Israel, that there would be some kind of security cooperation. After all, there is already some security cooperation, has been for some years, in terms of trying to cope with terrorists. That is one thing that can be done covertly. When something becomes overt, with the military force, then it becomes most difficult. You will remember, sir, that in 1970, when the Syrians moved into Jordan during the Black September period and the United States sought Israeli help for Jordan, one of the issues was whether Israeli troops and tanks should cross into Jordan. That, the Government of Jordan, King Hussein, absolutely refused. He was perfectly willing to be assisted by Israeli air power, 25,000 feet up, but on the ground it was something else. I say we have got a long period ahead of us yet with all of the states of the area before any kind of meaningful security cooperation with Israel can be developed. For now, those who can accept it, would prefer having it on a covert rather than an overt level.

Senator METZENBAUM. Mr. Chairman, on the lines of your comment concerning Senator Jackson and his desire for this kind of a hearing, I just want to say to the chairman who scheduled the hearing that I think this panel that we've called forth for information today has been extremely able and very forthcoming and was very enlightening to this Senator. Thank you.

Senator **Warner**. I share that observation, Senator Metzenbaum, and indeed the hearing today has set the tone and the challenge for this committee.

Before closing, however, Ambassador Eilts, you stressed the need for the progress in peace in the Middle East. In connection with our trip, we were briefed on a number of nations that are trying to work actively with the Iraq-Iran situation to achieve some reconciliation in that conflict. Are you aware of those overtures?

Ambassador **Eilts**. Yes I am.

Senator **Warner**. And particularly those nations that receive a substantial part of their petroleum from the gulf. In other words I don't want to close the hearing on the note that it's just the U.S. responsibility. Indeed a lot of nations are participating in this effort to reconcile that.

Ambassador **Eilts**. As a matter of fact, Senator, in connection with those efforts by states other than the United States, I do believe that many of them are feeling terribly discouraged. They have every reason to feel discouraged, given the negative reaction of Iran.

It might help just a bit, and I'm sure the Administration is already doing it, if the United States continued to encourage those states to stick in there and to continue their efforts to try to bring about not only a revived Middle East–Arab-South—peace effort, but also an Iraqi-Iranian peace.

Senator **Warner**. Did you wish to comment on that observation?

Mr. **Cordesman**. Only to say that I think Ambassador Eilts is completely correct. It is useful to make these peace attempts but I think talking to any Iranians, whether they are exiles or those who support the current government, they are seen in something which must occasionally be accounted for words but not taken seriously.

Senator **Warner**. Thank you gentlemen. We have a series of questions which counsel for the committee will provide you with. It's our hope that you could supplement your valuable testimony today by responses to these questions.

This concludes the hearing.

[Whereupon, at 12:50 p.m., the hearing was adjourned.]

APPENDIX

RESPONSES FROM THE DEPARTMENT OF ENERGY TO ADDITIONAL COMMITTEE QUESTIONS

Department of Energy
Washington, D.C. 20585

March 23, 1984

Honorable James A. McClure
Chairman, Committee on Energy
and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

On January 30, 1984, Secretary Hodel appeared before the Committee on Energy and Natural Resources to discuss the World Petroleum Outlook for 1984.

Following that hearing, you submitted written questions for responses. Enclosed are the answers to those questions with the exception of question 2a from the Minority members of the Committee. This response is being prepared and will be sent just as soon as possible.

If you have any questions, please call Ingrid Nelson or Tom Pretorius of my staff on 252-4277. They will be happy to assist you.

Sincerely,

Thomas H. Pretorius
for Robert G. Rabben
Assistant General Counsel
for Legislation

Enclosure

cc: D. Michael Harvey
Howard Useem
Al Astrin

POST-HEARING QUESTIONS AND ANSWERS
RELATING TO THE
JANUARY 30, 1984 HEARING
BEFORE THE
COMMITTEE ON ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

WITNESS: SECRETARY HODEL

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 1: On page 1 of your testimony you state that the "underlying softness of the oil market is expected to continue for a number of years to come, absent a significant disruption of world oil supplies."

Over the past ten years there have been three major international oil supply disruptions. Over the past three decades there have been thirteen significant international oil supply interruptions, only three of which occurred in countries located outside the Middle East.

-- What is your assessment of the probability of an oil supply interruption during the upcoming year, and over the remainder of this decade?

-- In what ways is the United States now prepared to deal with a major international oil supply disruption if one were to begin today?

Answer: Supply interruptions cannot be predicted with accuracy. Also, a supply interruption may occur without significant lasting impacts on price. Given the present tension between Iraq and Iran, the possibility of some kind of temporary disruptions exists and we cannot ignore this potential threat. The situation over the rest of the decade is very uncertain and wide open to speculation. The Department of Energy relies upon the CIA and other intelligence agencies for projections and assessments of this type.

I might point out that the 1980 Iran/Iraq war (i.e., the third "interruption in the last 10 years") did not lead to any lasting price increases as the shortfall was absorbed by other producers. Stocks were drawn down, and consumption was falling in response to previous price increases.

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 1b:	In what ways is the United States now prepared to deal with a major international oil supply disruption if one were to begin today?
Answer 1b:	Today, the United States is better prepared to respond to an energy emergency than it has been at any time in recent history. Not only has our vulnerability to such emergencies been reduced, but also our capability to respond, should an emergency occur, has been increased significantly in the past three years.

Central to the Administration's energy supply policy, both in periods of surplus and in supply emergencies, is a firm commitment to the principles of the free market. Past experience demonstrates that government intervention in energy markets does not work, primarily because the government in its regulatory attempts to control the market lacks the flexibility to deal adequately with all the complexities of our energy supply and demand system. Government intervention, at any level, creates rigidities that prevent or discourage market forces from adjusting to change and uncertainty. Thus, it is especially important during major supply disruptions to permit prompt and efficient market responses to adjust to a changing energy supply situation.

While we are committed to the principles of the free market, in no way should it be thought that we lack appreciation of the important role the Federal Government will have to play in the event of a major oil supply disruption. That role, however, will be significantly different than the one the Government played during the supply crises in the 1970's, when the Government assumed the burden of attempting to regulate petroleum prices and to allocate its supply throughout the Nation.

We are committed to the maintenance of government crude oil stocks that can be drawn down in the event of an emergency. We contend that private stocks, coupled with a significant level of public stocks, held worldwide, remain the strongest possible deterrent to politically-inspired embargoes and can be a primary defense against the impacts of any supply disruption, regardless of its origin. Therefore, we continue to encourage our allies to increase their strategic stock levels. As a result, this Administration has maintained a strong commitment to the construction and fill of a 750 million barrel Strategic Petroleum Reserve (SPR). The SPR presently contains over 385 million barrels of oil, which is three and a half times the size of the SPR when this Administration assumed office.

We believe that, in a major disruption, the early sale of SPR oil in large volumes ordinarily is the best policy for SPR use. This policy makes it possible to replace rapidly some oil lost because of a disruption and, therefore, to reduce price increases while worldwide supply and demand reach equilibrium. The marketplace needs to know in advance that this is our general policy so that unnecessary panic behavior can be avoided.

There currently exists a potential for fuel switching which is estimated to be in the range of 0.4 to 1.2 million barrels a day using natural gas which can help offset the lost petroleum supply impacts of a disruption.

Internationally, an important part of our energy emergency preparedness policy is the United States' continuing commitment to the International Energy Agency (IEA). We are fully aware of the interdependence of our energy security with that of the rest of the free world. Therefore, it is important that we maintain our strong commitment to the International Energy Program (IEP) and to the IEA oil emergency system, and continue to support IEA programs to remove market impediments, accelerate the development of new technologies, increase energy efficiency, and strengthen emergency preparedness through increased stocks.

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 2: The three most recent oil supply interruptions reduced international oil supplies only temporarily and marginally. Yet each created serious shortages and led to significant price increases. Is there any reason to believe that a future oil supply interruption -- one which again is both temporary and marginal -- would not have exactly the same consequences?

Answer: Supply disruptions resulting from the 1973 embargo and the 1979 Iranian revolution were accompanied by large increases in world oil prices with significant economic consequences for consuming countries followed by declines in real oil prices at least for a few years. These severe effects may be attributed in part to the relative tightness of world oil markets at the time, the general lack of capability of consuming countries to respond through increased production or inventory drawdown, and the existence of market-inhibiting government policies such as allocation and price controls. Despite the continuing existence of some counterproductive government controls during the 1980 Iran/Iraq war startup, the disruption did not cause the same price shocks as in previous disruptions. This was due primarily to falling demand from the 1979-80 price increases, significant unused production capacity and availability of high world stock levels in relation to consumption. The high stock levels provided a real as well as a psychological cushion, helping to prevent some of the panic in the market place which marked previous disruptions. Domestic price controls were eliminated in 1981 which will enable the market to function efficiently.

There are several reasons why near term "temporary and marginal" interruptions are less likely to produce consequences similar to those in 1973 and 1979, among them:

(1) Government regulatory policies employed during past disruptions have been replaced with policies that emphasize reliance on the market, complimented by SPR draw, rather than government programs, to price and allocate supplies. Government allocation programs based on historic consumption levels have caused severe distribution inefficiencies and regional supply dislocations and higher imports because of fundamental unresponsiveness to market signals. The absence of standby price and allocation controls also sends the correct signals to the private sector to prepare for energy disruptions.

(2) The Strategic Petroleum Reserve, now containing over 385 million barrels of crude oil, represents over 900 days of net U.S. oil imports, based on 1983 report levels. This is more than three times as large as it was in January of 1981. Given its size, it is now an extremely significant tool for use during an emergency. It can currently sustain an average drawdown rate of 1.7 million barrels per day for over five months and currently is projected to have a 4.5 million barrel per day drawdown capability once the 750 million barrel fill level is reached. This tool was not available for past disruptions. Other governments also have strategic stocks.

(3) There currently are over 10 million barrels per day of excess crude oil production capacity in the free world. Except for very severe disruptions which directly affect

large amounts of Persian Gulf production, it is reasonable to expect the responsive use of this capacity to compensate for interrupted supplies. However, even with large amounts of Persian Gulf production disrupted, there remains about 3+ MB/D excess capacity outside of the Gulf as well as 2.5 MB/D pipeline capacity from the Gulf. This excess production capability was not nearly as significant during past disruptions. It is estimated that significant excess world production will exist throughout the remainder of this decade.

(4) There also currently exists a potential for some fuel switching in the U.S. which is estimated to be in the range of 0.4 to 1.2 million barrels per day using natural gas which can also offset the lost petroleum supply during a disruption.

(5) Petroleum consumption as a share of overall free world energy consumption has declined over the last few years.

(6) To some extent, the effects of past disruptions have been worsened by panic reactions of the public, overractions by government officials, and conflicting information on the nature of the disruption from government sources. Future disruptions will be characterized by the use of well-thought-out public information programs that emphasize the dissemination of timely, consistent and accurate information to the public.

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 3: What is the Department of Energy's estimate of how long the current world oil "glut" will last?

— How much of the "glut" is due to a conservation-induced reduction in demand, how much is due to a recession-induced reduction in demand, how much is weather related, and how much is due to increased production?

— If there were an interruption of supplies coming out of the Arabian Gulf, are there sufficient sources of supply in the form of stocks and spare productive capacity in the U.S. and worldwide to fully offset such a shortfall?

Answer: The duration of the current soft world oil market is subject to a number of uncertainties.

Key uncertainties include:

- Unforseen supply interruptions caused, for example, by developments in the Iran-Iraq war;
- Rates at which new production of oil and alternative fuels is accomplished;
- Rate of recovery of demand for OPEC oil, a factor crucially dependent on the strength of the ongoing economic recovery, the extent to which more efficient capital stock continues to be installed based on price increases in the past, and on inventory decisions;
- OPEC's pricing and production discipline; and
- Seasonal weather patterns.

A major disruption to oil flows in the Middle East could cause a rapid turnaround in the present situation, quickly tightening oil supplies and reversing market psychology. On the other hand, if the pace of economic recovery in OECD countries is less or inventory behavior is different form that now anticipated, and oil consumption predictions do not hold, the oversupply conditions could be prolonged. Also, key to the outlook for continuation of present oil market conditions will be the ability of producers to continue to cooperate. Given the growing financial pressures in several producing countries, OPEC could be hard-pressed to forestall certain of its members from attempting to increase their market shares and cause an extension of present world oil conditions or a further decline in oil prices like that of last year.

It is difficult to estimate how much of the drop in oil consumption is due to conservation, recession, increased production, and other factors. One indicator of the degree of structural change in the use of oil is that while OECD economic activity is projected to grow by about 3-5 percent, oil consumption is projected to increased by only 1-2 percent.

In the event of a minor or partial interruption of Persian Gulf supplies, there appears to be enough excess production capacity to cover fully the shortfall. In the extreme event, however, of a complete oil supply disruption with an estimated 8 to 9 million barrel per day cutoff of Persian Gulf exports, existing spare production capacity would be insufficient to cover the entire shortfall. The extent to which free world stocks outside the Persian Gulf region would be able to offset the resulting net shortfall of supply (after taking into account excess production capacity) would depend upon a variety of factors, including the length of the disruption, decline in demand because of higher prices, and the incidence of fuel switching and emergency conservation.

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 3b: If there were an interruption of supplies coming out of the Arabian Gulf, are there sufficient sources of supply in the form of stocks and spare productive capacity in in the U.S. and world wide to fully offset the economic consequences of such a shortfall?

Answer 3b: The economic consequences of any Persian Gulf supply interruption would depend on a number of factors, e.g., the size and duration of the disruption, decisions concerning the drawdown of commercial and strategic stock reserves, the ability to bring slack production capacity on line, numerous psychological factors including the perceptions and expectations of market participants, fuel switching, etc.

Since most of the world's current excess production capacity lies within the Persian Gulf region, there is obviously a limited capability for any residual excess world production capacity fully to offset a complete cutoff of Persian Gulf supplies. Nevertheless, there are some three to four million barrels per day of excess production capacity potentially available outside the Persian Gulf region.

In addition, it is estimated that there were some 4700 million barrels (MMB) of crude oil and petroleum products held as primary stocks worldwide at the end of 1983. Of these, 3300 MMB are estimated to be necessary to maintain the operations of the oil supply system and are unavailable for drawdown during a disruption. Of the remaining 1400 MMB, 540 MMB were held in government-controlled, strategic stocks as follows: over 386 MMB in the U.S.; 80 MMB in Western Europe and approximately 80 MMB in Japan. About 860 million barrels were held as private, non-strategic convenience stocks in excess of minimum operating levels.

In addition, there currenlty exists a potential for fuel switching which is estimated to be in the range of 0.4 to 1.2 million barrels a day using natural gas which can help offset the lost petroleum supply impacts of a disruption.

We believe that a cooperative effort among the U.S. and our allies to utilize available stocks and share remaining oil supplies would reduce significantly the economic consequences of any Persian Gulf supply disruption.

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 4: What is DOE's current estimate of spare oil productive capacity throughout the world?

.. How much of this is located in countries inside of the Strait of Hormuz?

Anwer: The total spare free world oil productive capacity is currently estimated (on a 1984 calendar year basis) to be in the range of 10-12 million barrels per day. Of this total, approximately 7-8.5 million barrels per day are located in the Persian Gulf region, and about 3-4 million barrels per day are available outside of the Persian Gulf.

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 5: On page 11 of your testimony you note that U.S. reliance on OPEC oil has fallen significantly. But given that we live in an interdependent world, doesn't the high dependence of Japan, Western European countries and our other allies on OPEC mean that the U.S. would still be severely harmed by an oil supply disruption?

Japan-----------------79% of crude oil imports come from OPEC;
U.K.------------------51% of crude oil imports come from crude oil
West Germany----------63% of crude oil imports come from crude oil
Italy-----------------68% of crude oil imports come from crude oil

Answer: Today, the United States is better prepared to respond to an energy emergency than it has been at any time in recent history. Not only has our vulnerability to such emergencies been reduced, but our capability to respond, should an emergency occur, has been increased significantly in the past three years. However, it is very important that we not become complacent. While our vulnerability has been reduced, it has not been eliminated. Equally important is the fact that many of our allies remain significantly dependent on imported oil, particularly oil from the volatile Middle East. Obviously, any energy emergency affecting them also would have economic implications for us.

Because the world oil market is interdependent, the U.S. cannot insulate itself totally from the effects of a major disruption. For example, while last year less than 5 percent of our total domestic oil consumption passed through the Strait of Hormuz, some of our allies imported significant quantities of oil through the Strait. A blockage of the Strait would force those countries to seek new sources of supply, thus competing with the U.S. for available crude oil. This necessarily would put upward pressure on world crude prices and would draw away existing U.S. sources of imports in Mexico, Venezuela, etc. World oil will be distributed roughly in proportion to each country's relative total consumption--very shortly after any disruption. Through the world pricing mechanism, additional costs would have to be borne by U.S. consumers, just like all other oil consumers in the world.

Given the interdependence of our energy security with that of the rest of the free world, it is important that we maintain our strong commitment to cooperative international arrangements such as the International Energy Agreement. Through this agreement we can more accurately guage the nature and potential impacts of an emergency and effect a coordinated response which minimizes the economic losses to all countries involved.

QUESTIONS FROM JAMES A. MCCLURE, CHAIRMAN

Question 6: Wouldn't a new oil supply interruption exacerbate the world debt problem and thereby adversely affect the United States?

Answer: Within the Administration, the Treasury Department has the lead for analysis of international debt issues; however, the Department of Energy does work with Treasury on energy-related issues and can provide some general information on international debt impacts.

A major oil supply interruption of significant duration would adversely affect the world economy, and overall, this would hinder the export prospects of debtor countries trying to meet their debt service obligations. For several debtors which export oil, such as Mexico and Nigeria, prospects would improve, but for the majority of countries which are net oil importers the situation would worsen. Over the medium term, even the prospects for the oil producers might not improve. It should be recalled that the 1979-1980 oil price jump so depressed world economic activity that by 1982 even the oil exporting nations were facing difficulties.

QUESTIONS FROM THE DEMOCRATIC MEMBERS OF THE COMMITTEE

Question 1: This Administration intends to rely on a free market in the next oil disruption and to rely on high prices to stem demand. Do you believe that you can achieve this goal in a major supply disruption without providing some sort of economic response package for the poor who might otherwise be priced out of the market for even essential uses of petroleum such as heating oil? Testimony to this Committee and a House subcommittee last year revealed that the DOE was unable to obtain the necessary cooperation from other agencies to devise mechanisms for distributing aid to the poor. What are you doing about this? Do you think we can wait until the crisis hits to devise such mechanisms?

Answer: The Administration is concerned that some individuals might suffer hardship during an oil emergency, and we are considering alternative ways in which limited aid could be provided to the needy. There is a wide range of energy related funding which is already available to low income households. In addition, existing Federal and State programs would automatically provide increased benefits to many low-income and other groups. We have not yet determined whether any additional funding of existing programs or any new programs would be needed as well, to alleviate hardship. An interagency working group is currently studying this matter.

QUESTIONS FROM THE DEMOCRATIC MEMBERS OF THE COMMITTEE

Question 2b: In addition, the Administration has indicated that it might use the SPR as a substitute for a "fair sharing" plan and yet the current SPR drawdown plan is incompatible with using the SPR for that purpose.

Answer 2b: The current SPR Drawdown ("Distribution") Plan is fully compatible with the potential use of the SPR in conjunction with our IEP commitments. A SPR drawdown would reduce U.S. imports and thereby help the U.S. avoid incurring an obligation under the sharing formula of limiting imports to the level of the U.S. supply right. With SPR we do not expect the U.S. to incur a supply obligation, but should it occur we believe that our policies create an environment that will be conducive to both Reporting Companies and Non-Reporting Companies making voluntary offers to meet a U.S. allocation obligation. We believe voluntary offers will be forthcoming, because among other things, U.S. companies will know that, if the SPR is drawn down, they will be eligible to bid competitively for SPR oil to replace foreign cargoes directed to other IEA countries. Certainly, this Administration would want to take into consideration the aggregate amount of oil required to be supplied abroad by U.S. companies to meet the obligations of the United States pursuant to the IEP when we make decisions as to whether to draw down the SPR and, if so, in what amount. Obviously, numerous factors would bear upon those decisions, but it would be unreasonable not to take into account the supply needs of the domestic market to the extent those needs were affected by diversion of oil to our allies.

Some companies have suggested that further efforts such as a so-called "fair sharing" program will be necessary in an actual emergency. Some companies might be reluctant to run the risk of loss of market shares if they were to make voluntary offers to supply oil to IEA nations, or they might be fearful of not being able to purchase replacement oil at a price no higher than that at which they sold oil pursuant to a voluntary offer. Those companies should be aware of the following:

(1) To assure that the U.S. meets any IEP allocation obligation which it may incur, we will consult with U.S. companies to encourage their voluntary offers. These consultations with the U.S. industry at its highest levels will emphasize that the success of the sharing system is in this country's long-term interest and, therefore, in the interest of the companies; and (2) This Administration would not be supportive of measures which guaranteed oil companies that they necessarily would be able to purchase replacement oil at prices no higher than those at which they voluntarily sold oil internationally. The companies making voluntary offers pursuant to IEA emergency sharing will be free to make their own determinations as to the price at which they will sell, save for our insisting that oil shared be priced at comparable market transactions consistent with the Agreement on an International Energy Program and the provisions of the IEA's Emergency Management Manual.

QUESTIONS FROM THE DEMOCRATIC MEMBERS OF THE COMMITTEE

Question 3:	On page 10 of your statement you indicate that the petroleum stock levels in the U.S. went up between 1979 and the beginning of 1984, but as you point out, you are including the SPR in these totals. If you leave the SPR out, then U.S. private stocks have declined in this period. If you are going to include the SPR in total stocks available to the U.S. then there is the implication that you intend to use the SPR early in the next oil crisis. Can you give us your views on how willing you would be to use the SPR?
Answer:	As we have seen in the past, any substantial world oil disruption is likely to be accompanied by a sharp increase in the world price of crude oil and petroleum products. These price rises can impose substantial economic costs on the U.S. and other oil importing countries. An adequate SPR, used in a timely fashion and at meaningful drawdown rates to replace lost supply, will have a dampening effect on price increases. The SPR now has reached an important goal of representing more than 90 days of U.S. crude oil imports. The SPR, therefore, represents a viable tool. Consequently, I believe that, in a major disruption, the early sale of SPR oil in large volumes ordinarily is the best policy

for SPR use. This policy makes it possible to replace rapidly some oil lost because of a disruption and, in consequence, to reduce price increases while worldwide supply and demand adjust. The marketplace needs to know in advance that this is our general policy so that unnecessary panic behavior can be avoided.

QUESTIONS FROM THE DEMOCRATIC MEMBERS OF THE COMMITTEE

Question 4:	If an oil supply disruption occurred today and the IEA were triggered, could the U.S. rely on the voluntary sharing of oil by U.S. oil companies to achieve our IEA allocation obligations? In the absence of the IEA anti-trust exemption wouldn't your only option be to exercise the mandatory authority of section 251 of EPCA to force the oil companies to allocate oil to our IEA allies? Isn't that somewhat ironic?
Answer:	On March 15, 1984, the Congress approve a simple extension of EPCA Section 252 until June 30, 1985. When signed by the President, this exemption will facilitate U.S. oil company involvement in IEA activities including any possible U.S. allocation obligations. This recently approved exemption should respond to the Committee's concerns on U.S. oil company participation issues.

QUESTIONS FROM THE DEMOCRATIC MEMBERS OF THE COMMITTEE

Question 5:	Recently the Administration expressed its strong concern about the growing reliance of our European allies on the Soviet Union as an energy source. The forum for working with our allies on this issue appears to be the IEA. Doesn't that add yet another reason why this Administration in particular should remain committed to the IEA?
Answer:	Yes, we consider the IEA an appropriate forum for discussion of issues of this type. My first official foreign trip as Secretary of Energy was to represent the United States at the IEA Ministerial meeting in May 1983. At that time, I reaffirmed the United States' strong support for the IEA. During that meeting the 21-member nations had reached agreement on an Energy Requirements and Security study. This work helped to satisfy many of my deep concerns about the growing dependence of European countries on Soviet gas. The Ministers agreed to avoid undue dependence on any one source of energy and to implement security measures and protect against disruptions.

QUESTIONS FROM THE DEMOCRATIC MEMBERS OF THE COMMITTEE

Questions 6: Secretary Hodel, you recently reassigned functions among your Assistant Secretaries. For example, the William Vaughan who was confirmed by the Senate as the Assistant Secretary for Emergency Planning, Safety, and the Environment is supposedly now the Assistant Secretary for Fossil Energy. Do you intend to resubmit for confirmation the names of those persons who now are no longer holding the positions for which they were confirmed? Why not?

Answer: There are no plans to submit for reconfirmation the names of the Assistant Secretaries who were affected by the program realignment actions effective January 24, 1984. Actions which have been taken are considered to be clearly within the authority of the Secretary and are consistent with the intent of provisions of the DOE Organization Act. The attached memorandum summarizaes the DOE General Counsel views on the legal authority available to the Secretary in connection with reorganization actions.

Department of Energy
Washington, D.C. 20585

January 26, 1984

Memorandum for The Secretary

Through: Theodore J. Garrish
General Counsel

From: Melinda L. Carmen M. Carmen
Ralph D. Goldenberg

Subject: Reorganization of the Department

This memorandum examines the legal authority available to the Secretary in connection with the plan to reorganize the Department announced on January 19, 1984, and memorializes the opinions arrived at during previous discussions on this subject. The reorganization plan involves, among other things, realignment of functions among several Assistant Secretaries; details of the reorganization plan are set forth below.

Section 643 of the DOE Organization Act, 42 U.S.C. 7253, affords the Secretary broad authority to adjust the Department's internal structure. That section provides:

> Sec. 643. The Secretary is authorized to *establish, alter, consolidate or discontinue such organizational units or components within the Department as he may deem to be necessary or appropriate*. Such authority shall not extend to the abolition of organizational units or components established by this Act, or to the transfer of functions vested by this Act in any organizational unit or component. 1/ (Emphasis added.)

Section 642 of the Act, 42 U.S.C. 7252, complements section 643 by authorizing the Secretary to delegate all his functions: 2/

1/ The Act does not establish any specific Assistant Secretary unit or component, and does not vest any specific function in any specific Assistant Secretary unit or component.

2/ For purposes of the DOE Organization Act, the word "function" is a term of art that includes ". . . power, authority, responsibility, right, privilege, and activity . . . ." Section 2(b)(1), 42 U.S.C. 7101(b)(1).

> Sec. 642. Except as otherwise expressly prohibited by law, and except as otherwise provided in this Act, the Secretary may delegate any of his functions to such officers and employees of the Department as he may designate, and may authorize such successive redelegations of such functions within the Department as he may deem to be necessary or appropriate.

Title III of the Act, 42 U.S.C. 7151-59, vests all statutory functions of the Department in the Secretary, with the exception of those functions further transferred exclusively to the Federal Energy Regulatory Commission and certain other functions not pertinent to this discussion. Thus, unless there is some further statutory impediment, it seems clear that section 643 of the Act expressly authorizes precisely the sort of purely internal reorganization at issue here.

Under the reorganization plan, the current Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness will become Assistant Secretary for Fossil Energy, but will retain his existing responsibility for management of the Strategic Petroleum Reserve and the Naval Petroleum Reserves. The current Assistant Secretary for Fossil Energy (who is also now serving as Acting Director of the Office of Policy, Planning and Analysis) will assume the new position of Assistant Secretary for Policy, Safety, and Environment, retaining his Department-wide policy, planning, and analysis function. Emergency preparedness planning and operations will be reassigned from the Assistant Secretary for Environmental Protection, Safety, and Emergency Preparedness to the Assistant Secretary for International Affairs. The commercial uranium enrichment program (now conducted by the Assistant Secretary for Nuclear Energy) will be reserved to the Secretary, with day-to-day oversight to be provided by the Director of the Civilian Radioactive Waste Management Program (yet to be named). Other elements of the reorganization are described in the Department's January 20, 1984 press release (copy attached).

Section 203(a) of the Act, 42 U.S.C. 7133(a), specifies that there shall be eight "Assistant Secretaries" to whom the Secretary "shall assign" various functions listed in subsections 203(a)(1) through (11). Clearly if the Secretary is empowered to assign functions to Assistant Secretaries, he also has the power to change their functional assignments. Under the reorganization plan, several such changes will be made, although functions currently performed by Assistant Secretaries will continue to be performed by Assistant Secretaries, 3/ with the exception of the commercial uranium enrichment program, which is reserved to the Secretary. Section 203(b), 42 U.S.C. 7133(b), raises another issue. It requires the President to "identify with particularity the function or functions

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3/ Not all of the functions addressed by the reorganization plan are listed in section 203(a), e.g., emergency preparedness.

described in subsection (a)" that an individual nominated to be an Assistant Secretary will carry out. The House bill that preceded the Act named nine Assistant Secretaries and specifically tied particular functions to individual Assistant Secretaries, while the Senate bill provided for eight Assistant Secretaries and listed functions to be performed by Assistant Secretaries, leaving to the Secretary decisions as to specific assignments. The legislative history suggests that when these bills came to conference, it was determined that a compromise should be struck between locking in functions at the time of nomination and not requiring any indication of functions at that time. Thus, section 203, as enacted, reflects a repudiation of the House bill and a move toward the Senate bill, with the intent that functional assignments of Assistant Secretaries be an executive/managerial issue, rather than a legal issue (see H.R. Rep. No. 95-539, p. 56) and that the Secretary have broad discretion in Departmental organization. The language of section 203 simply requires the President to identify the functions the Secretary, at the time of nomination, intends to assign to the particular Assistant Secretary. It does not require that the functions of any Assistant Secretary be limited to those formulated at the time of nomination, nor does it preclude changing of functions by the Secretary after confirmation and appointment.

The Secretary's internal reorganization authority reflected in section 643 of the Act could not exist in a meaningful way under any more expansive interpretation of section 203(b) that would "lock in" the functions of an Assistant Secretary upon confirmation and appointment. Under such an interpretation, the Secretary would have reorganization power at lower levels of the Department, but not at the Assistant Secretary level, with which the Secretary is most familiar, and where, from the Secretary's point of view, it is most needed. The section 203(b) procedure facilitates review during the confirmation process of a nominee's general qualifications in the context of functions that he will be assigned upon assuming office. It is not intended to preclude additional functions not specified, or, at some later date, functions perhaps entirely different if the exigencies of management so require.

Finally, with regard to the Secretary's plan for the enriched uranium program, it should first be noted that the language of the Nuclear Waste Policy Act of 1982, 42 U.S.C. 10101-10226, in no way precludes the Secretary from assigning to the Director of the Civilian Radioactive Waste Management Program additional functions not mentioned in that Act. And, although "enriched uranium production" is one of the functions listed in section 203(a)(1) for assignment by the Secretary to the Assistant Secretaries, the very language of the section reflects that such functions reside with the Secretary before assignment to an Assistant Secretary (as in fact they do by virtue of Title III of the Act). Inherent in that concept is the notion that the Secretary, as the head of the Department, can choose to reserve to himself rather than assign a particular function. Thus, under the reorganization plan, the Secretary will be taking back to himself the commercial uranium enrichment function and delegating only the day-to-day oversight function to the Director of the Civilian Radioactive Waste Management Program. 4/ Also, there is precedent for the assignment of functions listed in section 203(a) to other than Assistant Secretaries; on October 1, 1979, then Secretary Duncan transferred functions associated with Intergovernmental Relations, Public Affairs, Congressional Relations, and Consumer Affairs - all functions enumerated in section 203(a) - from the Assistant Secretary for Intergovernmental and Institutional Relations (which position was abolished) to entities within the Office of the Secretary (see DOE N 1100.3, 9/28/79, copy attached).

It is therefore my view that the Secretary has the requisite authority under the DOE Organization Act to effect the Departmental reorganization described in the plan announced on January 19, 1984.

Attachments
1. 1/20/84 press release
2. DOE N 1100.3 (9/28/79)

Concurrence:

NOTE TO THE SECRETARY

The above memorandum is consistent with the advice I have previously rendered to you on this subject and I completely concur in its conclusion.

Theodore J. Garrish
General Counsel

4/ The Director of the Civilian Radioactive Waste Management Program is appointed by the President, by and with the advice and consent of the Senate, at level IV of the Executive Schedule. The position is therefore of equivalent level to an Assistant Secretary. See section 304 of the Nuclear Waste Policy Act of 1982, 42 U.S.C. 10224.

Department of Energy
Washington, D.C. 20585

April 17, 1984

Honorable James A. McClure
Chairman, Committee on Energy
  and Natural Resources
United States Senate
Washington, D.C. 20510

Dear Mr. Chairman:

On January 30, 1984, Secretary Hodel appeared before the Committee on Energy and Natural Resources to discuss the World Petroleum Outlook for 1985.

Following that hearing, you submitted written questions for response. On March 23, we sent you responses to these questions with the exception of question 2a. Enclosed is the 2a answer which completes our response.

If you have any questions, please call Ingrid Nelson or Tom Pretorius of my staff on 252-4277. They will be happy to assist you.

Sincerely,

for Thomas H. Pretorius
Robert G. Rabben
Assistant General Counsel
for Legislation

Enclosure

cc: D. Michael Harvey
    Howard Useem
    Al Astrin

QUESTIONS FROM THE DEMOCRATIC MEMBERS OF THE COMMITTEE

QUESTION 2(a): Are you satisfied with the current SPR drawdown plan? For example, the plan provides that anyone, including foreign oil companies and foreign speculators, may bid for SPR oil.

ANSWER: Yes. Although our policy is to maximize the universe of eligible bidders, this does not mean we are encouraging frivolous or irresponsible bids for SPR oil. We have adopted Standard Sales Provisions for the sale of SPR oil which are carefully designed to prevent misuse of SPR oil by bidders, foreign or domestic, who tried to speculate on its purchase without a serious purpose of moving it into the marketplace in a timely manner. The Standard Sales Provisions contain stringent performance and financial responsibility provisions to assure that no person will bid on SPR oil unless he intends to sign a contract to buy it, and that no person will sign such a contract without making firm arrangements to lift it at the agreed time. Among the measures we have adopted we have adopted are offer and payment guarantees and significant liquidated damages for the unexcused failure to lift oil on schedule.

Insofar as the question expresses concern regarding foreign companies buying SPR oil, as the Administration has indicated previously, ample legal authority presently exists to prohibit any undesired export of SPR oil. These authorities are summarized in the Standard Sales Provisions, so any prospective bidder is made aware of the panoply of export restrictions. There may be certain circumstances, however, such as the need to support our

International Energy Program commitments, when the export of selective volumes of SPR oil may be in our national interest. Moreover, export of SPR oil to Carribean refineries may be necessary to accommodate the petroleum product requirements of geographic areas, such as the Northeast, which typically rely upon such refineries.

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